Greater Natural Buttes
Draft
Environmental Impact Statement
DES 10-31

Volume I
(Chapters 1 through 9)

Vernal Field Office/Utah

Bureau of Land Management

July 2010

BLM Mission Statement

The Bureau of Land Management is responsible for the stewardship of our public lands. It is committed to manage, protect, and improve these lands in a manner to serve the needs of the American people for all times.

Management is based upon the principles of multiple use and sustained yield of our nation's resources within a framework of environmental responsibility and scientific technology. These resources include recreation, rangelands, timber, minerals, watershed, fish and wildlife, wilderness, air and scenic, scientific, and cultural values.

United States Department of the Interior

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IN REPLY REFER TO:
LLUTG01000
1790
UT-080-07-807

Dear Public Land User:

The Draft Environmental Impact Statement (EIS) for the Greater Natural Buttes Area Gas Development Project is hereby submitted for your review and comment. It was prepared to analyze the potential impacts of and alternatives to Kerr-McGee Oil & Gas Onshore LP's proposed wellfield infill development scenario. The Greater Natural Buttes Project Area (GNBPA) encompasses approximately 162,911 acres in an existing gas producing area located in Township 8 South, Ranges 20 through 23 East; Township 9 South, Ranges 20 through 24 East; Township 10 South, Ranges 20 through 23 East; and Township 11 South, Ranges 21 and 22 East (Salt Lake Meridian) in Uintah County, Utah.

This Draft EIS analyzes four alternatives in detail: the No Action Alternative, the Proposed Action Alternative (the Agency Preferred Alternative), a Resource Protection Alternative and an Optimal Recovery Alternative. The Draft EIS also contains a discussion of other alternatives that were considered but eliminated from detailed analysis. Under the Proposed Action, up to 3,675 new gas wells would be drilled over a period of 10 years. Additionally, approximately 760 miles of new roads, 820 miles of buried pipelines, 587 miles of surface pipelines, 7 miles of electrical power lines, 2 mancamps, 2 compressor stations, and water disposal facilities would be constructed to support this proposed development. Total new surface disturbance under the Proposed Action would be approximately 12,658 acres, or 8% of the total GNBPA.

The Draft EIS was prepared pursuant to the National Environmental Policy Act (NEPA), as well as other regulations and statutes, to address possible environmental and socio-economic impacts that could result from implementation of the project. This Draft EIS is not a decision document. Its purpose is to inform the public and the Decision Maker of the impacts associated with implementing the proponent's drilling proposal, to evaluate alternatives to the proposal, and to solicit other agencies and the public for comments.

If you wish to submit comments on this Draft EIS, we request that you make them as specific as possible, with references to page numbers and chapters of the document. The most useful comments will contain new technical or scientific information, identify data gaps in the impact analysis, or provide technical or scientific rationale for opinions or preferences. Please refer to "Greater Natural Buttes EIS" in your correspondence. Written comments will be accepted by fax,

email, or letter for 45 days following the publication of the Notice of Availability in the Federal Register by the U.S. Environmental Protection Agency. Please provide your comments to:

Bureau of Land Management
Attn: Stephanie Howard
Vernal Field Office
170 South 500 East
Vernal, Utah 84078
Fax: 435-781-4410
UT_Vernal_Comments@blm.gov

Before including your address, phone number, email address, or other personal identifying information in your comment, you should be aware that your entire comment – including your personal identifying information – may be made publicly available at any time. While you may ask us in your comment to withhold your personal identifying information from public review, we cannot guarantee that we will be able to do so. BLM will not consider anonymous comments. Comments, including names and street addresses of respondents, will be available for public review at the BLM Vernal Field Office from 7:45 a.m. to 4:30 p.m. Monday through Friday, excluding federal holidays. Comments may be published as part of the NEPA document and other related documents. All submissions from organizations or businesses will be made available for public inspection in their entirety. For further information concerning the document, please contact Stephanie Howard at (435) 781-4469.

Sincerely,

Michael G. Stiewig
Vernal Field Office Manager

Enclosures – As Stated

Draft Environmental Impact Statement (EIS)
Kerr-McGee Oil & Gas Onshore LP (KMG)
Greater Natural Buttes

Lead Agency: U.S. Department of the Interior Bureau of Land Management (BLM)

Project Location: Uintah County, Utah

Comments & Further Information On the Draft EIS:

Stephanie Howard, Project EIS Team Lead
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BLM Authorized Officer Responsible for Preparing the Draft EIS: Mike Stiewig, Field Manager

Abstract

KMG proposes to develop oil and gas resources within the 162,911-acre Greater Natural Buttes Project Area (GNBPA) located in Uintah County south of Vernal, Utah. The GNBPA is partially developed with 1,562 existing oil and gas wells and associated infrastructure (including 23 compressor stations, access roads, water management facilities, pipelines, and power lines) with an estimated disturbance of 7,766 acres. The Proposed Action would include the development of an additional 3,675 well pads at 20-acre spacing and associated infrastructure. Construction would begin after the issuance of the Final EIS and Record of Decision, approval of individual Applications for Permit to Drill, and approved Right-of-Way grants. Construction would require approximately 10 years with the productive life of the project estimated at 30 to 50 years.

Four alternatives were analyzed in detail in this Draft EIS. They are the No Action Alternative, Proposed Action, Resource Protection Alternative, and Optimal Recovery Alternative. The No Action Alternative would consist of denying KMG's proposed development of federal leases, but would include new development on federal leases (1,102 new wells and associated infrastructure) as disclosed through previously approved National Environmental Policy Act decision documents. The Proposed Action would consist of KMG's proposal for developing the GNBPA. The Resource Protection Alternative would limit development to 40-acre well pad spacing by utilizing directional drilling, thereby reducing the potential number of new single well pads and reducing the project disturbance. The Optimal Recovery Alternative would involve development of new well pads on 10-acre well spacing to maximize the recovery of hydrocarbon resources, thereby increasing project disturbance. Under all alternatives, development would continue on State and private leases including roads and pipelines crossing federal lands to access the State and private leases. In addition to KMG's commitment to voluntarily apply the applicant-committed environmental protection measures listed in Appendix A of this document, mitigation is recommended that would lessen the environmental effects of the proposed project.

Written comments on the Draft EIS will be accepted by the Vernal Field Office of the BLM throughout a 45-day public comment period beginning on the date the United States Environmental Protection Agency publishes a Notice of Availability for this EIS. A summary of the comments and responses to the comments will be provided in the Final EIS.

Executive Summary

Kerr-McGee Oil & Gas Onshore LP (KMG), a wholly owned subsidiary of Anadarko Petroleum Corporation, has notified the Bureau of Land Management's (BLM) Vernal Field Office that it proposes to conduct infill drilling to develop the hydrocarbon resources from oil and gas leases owned, at least in part, by KMG within the Greater Natural Buttes Project Area (GNBPA) in Uintah County, Utah (**Figure ES-1**). KMG intends to develop all potentially productive subsurface formations underlying the GNBPA. The formations include, but are not limited to, the Green River Formation, Wasatch Formation, Mesa Verde Group (including the Blackhawk Formation), Mancos Shale, and Dakota Sandstone.

The GNBPA consists of approximately 162,911 acres in an existing gas producing region located on lands owned by the federal government, the State of Utah, the Ute Tribe, and other private land owners. Federal lands in the proposed GNBPA are under the jurisdiction of the BLM Vernal Field Office. The Vernal Field Office has determined that the proposed project constitutes a major federal action requiring the development of an environmental impact statement (EIS). This EIS serves the purpose of disclosing and analyzing impacts resulting from the level of development proposed within the GNBPA, including a no action alternative, with consideration of identified and applied applicant-committed environmental protection measures (ACEPMs) and recommended mitigation measures. A summary of these ACEPMs is provided in **Appendix A**.

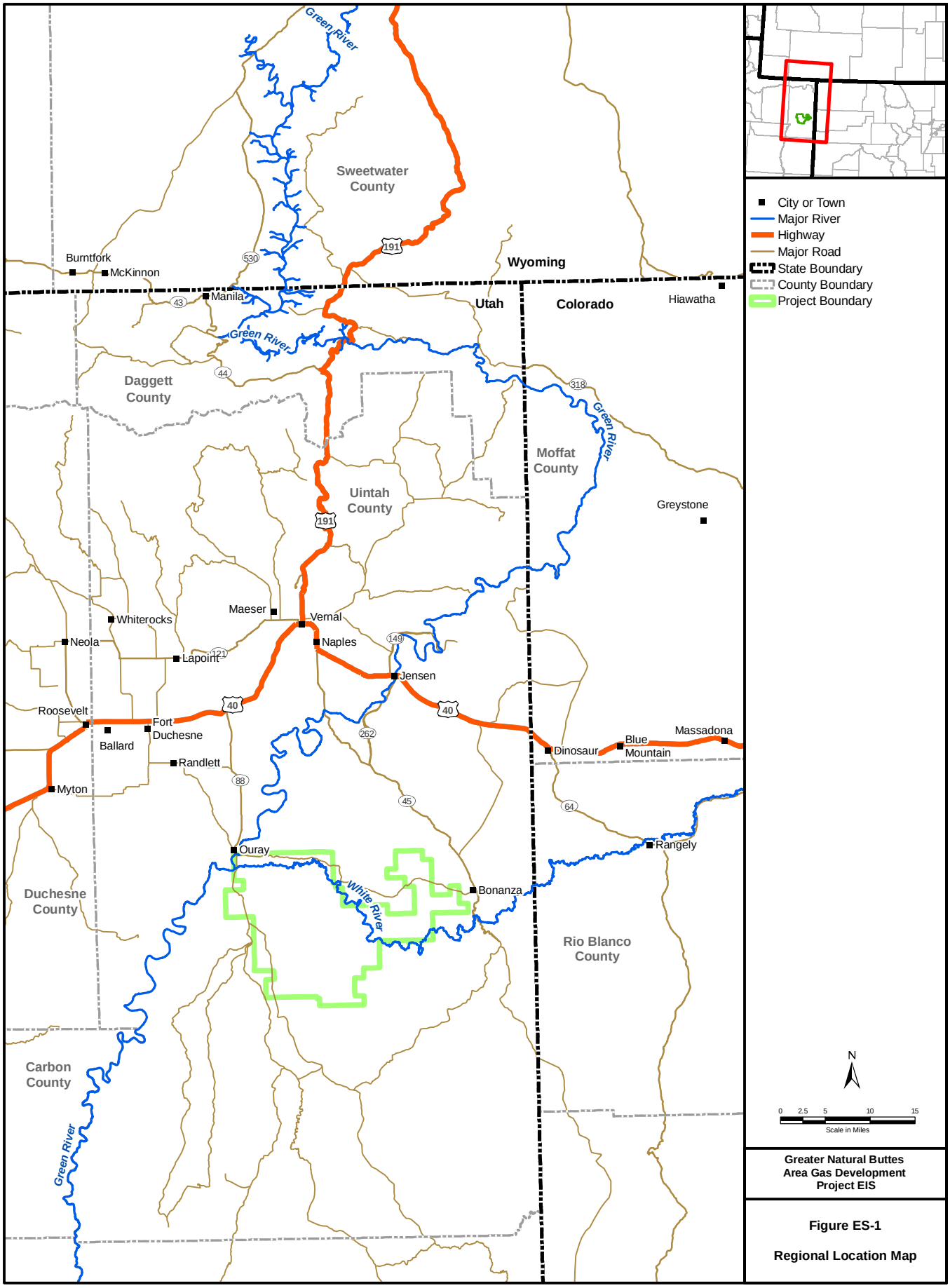
Purpose and Need

The need for a BLM action is to respond to this proposal and to evaluate action on future plans and applications related to this proposal. The Federal Land Policy and Management Act of 1976 (Public Law 94-579, 43 United States Code [USC] 1701 et seq.) recognizes oil and gas development as one of the "principal" uses of the public lands. Federal mineral leasing policies (Mineral Leasing Act of 1920, 30 USC 188 et seq.) and the regulations by which they are enforced recognize the statutory right of lease holders to develop federal mineral resources to meet continuing national needs and economic demands. The purpose of this EIS is to facilitate the BLM decision-making process of whether to approve, approve with modifications, or disapprove the proposed project or project components based on an evaluation of the expected impacts. Through this process, the BLM's purpose is to minimize or avoid environmental impacts to the extent possible, while allowing KMG to exercise its valid lease rights.

KMG, a private corporation, proposes development of their leases in the GNBPA for the purpose of making a profit on the extraction and sale of oil and gas resources. In addition to developing the subsurface resources in the GNBPA and testing directional drilling technologies, KMG's proposed project would increase the supply of domestic natural gas and liquid hydrocarbons and contribute to the economic vitality of the local communities through increased employment opportunities and expanded tax bases. KMG's proposed natural gas and oil development project is consistent with the National Energy Act of 2005 and the National Energy Policy (President's Plan) because it would provide a domestic source of natural gas and oil to meet rising national energy demand.

Scoping

The BLM conducted public and internal scoping to solicit input and identify environmental issues and concerns associated with the proposed project. The public scoping process was initiated on October 5, 2007, with the publication of a Notice of Intent in the Federal Register. The BLM prepared a scoping information notice and provided copies to the public, other government agencies, and Tribes. These announcements included information on a public scoping and open house, which was held at the Western Park Conference Center in Vernal, Utah, on October 23, 2007. The official scoping period ended November 5, 2007. Written comments were received during the public scoping period consisting of nine letters: two from federal agencies,



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one from state agencies, one from a county agency, one from a non-governmental organization, and four from industry or private individuals. During the scoping period, key concerns were identified for consideration in preparing the Greater Natural Buttes EIS.

The BLM conducted internal scoping to compile a list of resources potentially present in the Vernal Field Office area to be considered in this EIS. Based on this list, the following resources are discussed and analyzed in Chapters 3.0, 4.0, and 5.0 of this document:

- Air Quality;
- Cultural Resources and Native American Traditional Values;
- Geology;
- Land Use;
- Paleontology;
- Range Resources;
- Recreation;
- Socioeconomics and Environmental Justice;
- Soils;
- Transportation and Access;
- Vegetation Resources;
- Visual Resources;
- Water Resources;
- Wilderness Characteristics; and
- Wildlife and Fisheries Resources.

The BLM has determined that the proposed project is in conformance with the BLM management plans and policies and is consistent with other federal and local land management plans and policies. As allowed under 36 Code of Federal Regulations (CFR) 800.8, the BLM will use the public comment process under the National Environmental Policy Act (NEPA) to comply with the public consultation requirements of Section 106 of the National Historic Preservation Act.

Proposed Action and Alternatives

Chapter 2.0 of this EIS describes the existing and approved oil and gas facilities and the proposed development alternatives, including a no action alternative, analyzed in this document. In developing the alternatives, the BLM followed guidance set forth in 40 CFR 1500-1508 and the BLM NEPA Handbook H-1790-1 (BLM 2008a). The BLM Instruction Memorandum No. 2005-247, Attachment 1, also provides recommendations on developing a range of reasonable alternatives for oil, gas, and geothermal development activities. Based on this guidance, the BLM developed four alternatives for analysis in this EIS as described in the following paragraphs. The BLM preferred alternative is the Resource Protection Alternative.

Existing oil and gas infrastructure in the GNBPA (as of October 2007) consists of 1,562 vertical productive wells generally drilled on single well pads. Supporting infrastructure associated with this existing development includes access roads, mancamps, compressor stations, a gas processing plant, water management facilities (evaporation, recycling, and injection), gas and water pipelines, and power lines. The existing surface disturbance in the GNBPA as of October 2007 is estimated at 7,766 acres or about 4.8 percent of the GNBPA. This date was selected as a fixed point in time to represent information that is continuously changing. While

the BLM recognizes there is a gap between this point in time and the publication date of this document, the information provides a consistent basis for evaluation of the proposed project and alternatives.

No Action: Under the No Action Alternative, drilling and completion of development wells and infrastructure would continue as described in approved NEPA decision documents. An estimated 1,102 wells remain to be drilled in addition to the 1,562 existing wells in the GNBPA (as of October 2007). Supporting infrastructure associated with this alternative includes access roads, compressor stations, water management facilities (evaporation, recycling, and injection), gas and water pipelines, and power lines. Because reclamation is difficult to achieve in the Uinta Basin, all disturbance is assumed to be present for more than 3 years, typically for the life of the project. The total estimated new surface disturbance for the No Action Alternative would be approximately 4,702 acres or about 2.9 percent of the GNBPA.

Proposed Action: This alternative consists of KMG's proposed infill drilling project within the GNBPA to develop an additional 3,675 wells drilled from a maximum of 3,041 new well pads placed at up to 20-acre surface spacing. KMG and other operators would drill additional wells at an average rate of approximately 358 wells per year over a period of 10 years or until the resource base is fully developed. The productive life of each well is estimated to be approximately 30 to 50 years. In support of the new wells, KMG would construct access roads, pipelines, electric power lines, compression facilities, and water disposal facilities. The total estimated new surface disturbance for the Proposed Action would be approximately 12,658 acres or about 7.8 percent of the GNBPA.

Portions of the GNBPA pose environmental constraints to drilling a vertical well from the surface, based on the following factors:

- Topography, including steep slopes that preclude construction of a well pad for a vertically drilled well without major cuts-and-fills;
- The viewshed (line-of-sight from the centerline up to 0.5 mile along both sides of the river) of the White River corridor, outside of the Indian Trust Lands; and
- Areas within 600 feet of the White River within the Indian Trust Lands.

In areas where the gas resources in the reservoirs warrant a downhole spacing of less than 20 acres based on reservoir engineering evaluation, or in those areas where environmental constraints preclude vertical wells, KMG would test and attempt to utilize directional drilling technology. Analysis of the Proposed Action Alternative assumes vertical wells would be drilled at all 3,041 new well pad locations.

Resource Protection Alternative: This alternative consists of the same number of wells as the Proposed Action (3,675 wells) but surface well pads would be limited to 40-acre spacing, resulting in a reduced number of well pads (approximately 1,484 well pads) and a reduction in the surface disturbance of the project. If full recovery of the natural gas resource requires the drilling of wellbores at a downhole spacing of 20 acres or less, then directional drilling techniques would be required under this alternative. Therefore, impact analysis of this alternative assumed 1,557 directionally drilled wellbores to establish the same number of wellbores (3,675) as the Proposed Action Alternative.

As discussed under the Proposed Action Alternative, KMG and other operators would drill additional wells at an average rate of approximately 358 wells per year over a period of 10 years or until the resource base is fully developed. The estimated productive life of each well would be approximately 30 to 50 years. The disturbance impacts associated with production facilities (mancamps, compressor stations, water tank batteries, and water disposal wells) as well as electrical power requirements is expected to be the same for this alternative as it would be for the Proposed Action Alternative. The total estimated new surface disturbance for the Resource Protection Alternative would be 8,147 acres or about 5 percent of the GNBPA.

The location of the 40-acre spaced well pads for this alternative would reflect avoidance of the following constraining factors:

- Topography, including steep slopes that preclude construction of a well pad for a vertically drilled well without major cuts-and-fills;
- The viewshed of the White River corridor (line-of-sight from the centerline up to 0.5 mile along both sides of the river), outside of the Indian Trust Lands;
- Areas within 600 feet of the White River within the Indian Trust Lands; and
- Areas within the 100-year floodplain of the White River and 5 miles up major tributaries.

Optimal Recovery Alternative: This alternative maximizes the recovery of natural gas resources by increasing surface well pad spacing to 10 acres throughout the GNBPA. Assuming a vertical well would be drilled from each new well pad, KMG and other operators would drill an estimated 13,446 new wellbores within the GNBPA. KMG's activities would remain largely as outlined under the Proposed Action Alternative. Additional wells would be drilled at an average rate of approximately 672 wells per year using 28 drilling rigs and would be drilled over a period of approximately 20 years or until the resource base is fully developed. The estimated productive life of each well would be approximately 30 to 50 years. The drilling schedule, well drilling and completion parameters, equipment and manpower requirements, compressor stations, water disposal facilities, buried water and gas pipelines, electric power facilities, and ancillary facilities would be similar to that for the Proposed Action Alternative, but in some cases, more facilities would be constructed because of the higher number of wells and increased gas volumes produced under this alternative. The total estimated new surface disturbance for the Optimal Recovery Alternative would be 42,620 acres or about 26 percent of the GNBPA.

Alternatives Considered but Eliminated from Detailed Analysis: The BLM considered two alternatives to the proposed project that were not carried forward for detailed analysis in subsequent chapters of this document. One of these alternatives was one in which no further development would take place in the GNBPA. This alternative is not the same as the No Action Alternative, which is required under NEPA and is fully analyzed in this document. The No Action Alternative would occur if the BLM were to deny KMG's proposal. The no further development alternative was eliminated from detailed analysis because ongoing development continues on valid leases within the GNBPA as disclosed under existing NEPA decision documents (Section 2.4.1).

The BLM also considered a phased development alternative, which was intended to rotate concentrated disturbance activities through smaller, pre-defined areas (subareas) while the remainder of the GNBPA would be less impacted than under the Proposed Action. Under this alternative, one subarea at a time would be open to oil and gas construction and development activities for a limited time period, after which construction and development activities would cease. Oil and gas extraction and processing would continue (i.e., operational activities) in the subarea, while construction and development activities would move to another subarea. An additional intent was to encourage concurrent and efficient reclamation of surface disturbance. This alternative was eliminated from detailed analysis because the BLM could not impose phased development on almost one-half (45 percent) of the GNBPA, phased development could delay surface owner benefits (such as payments or hiring preferences for Ute Tribe members), production and maintenance activities would continue throughout the currently developed areas of the GNBPA, and development would be concentrated on individual grazing allotments (Section 2.9).

Affected Environment

Chapter 3.0 of the EIS describes the affected environment of the GNBPA for each of the resources identified during internal scoping and listed above. These resources are present within the GNBPA and provide the basis to address substantive issues of concern brought forward during internal and public scoping. The information presented in Chapter 3.0 provides quantitative data and spatial information where appropriate to

the resource that serves as a baseline for comparison of the direct, indirect, and cumulative impacts of each of the alternatives.

Environmental Consequences

Chapter 4.0 describes the environmental effects of implementing the alternatives on the affected environment as described in Chapter 3.0. The chapter is divided into subsections addressing the specific incremental impacts for each of the resources identified during internal scoping listed above. For each resource, the impact analysis was focused on the new disturbance associated with the No Action Alternative, which is over and above the existing disturbance in the GNBPA. For each of the action alternatives (Proposed Action, Resource Protection Alternative, and Optimal Recovery Alternative), the new disturbance is over and above the existing disturbance and the new disturbance associated with the No Action Alternative. The resource-specific effects of the alternatives are evaluated quantitatively and qualitatively, as appropriate based on available data and the nature of the resource analyzed. A comparison of disturbance within the GNBPA associated with the four alternatives is provided in **Table ES-1**. A summary of the Chapter 4.0 impact analyses is provided in **Table ES-2**.

Cumulative Impacts

Cumulative impacts from past, present, and reasonably foreseeable development are presented in Chapter 5.0 of the Draft EIS. For each resource, the Cumulative Impact Study Area (CISA) was developed appropriate to the geographical extent of anticipated cumulative impacts. For some resources (e.g., cultural resources and Native American traditional values, geology, paleontology, soils and vegetation), the CISA is the same as the GNBPA. For other resources (e.g., socioeconomics and air quality), the CISA includes the majority of the Uinta Basin, which encompasses the Vernal planning area.

Due to the intensity of energy development activity in the Vernal planning area, the focus of this analysis is on past, present, and reasonably foreseeable oil and gas development. A total of 18,666 well pads and 82,833 acres of cumulative surface disturbance, including the Proposed Action, is estimated to occur due to past, present and reasonably foreseeable projects in the Vernal planning area. The Proposed Action would represent approximately 20 percent of the total number of well pads and 15 percent of the cumulative surface disturbance in the Vernal planning area. The Proposed Action would represent approximately 48 percent of the 26,411 acres of cumulative surface disturbance (i.e., existing, No Action, and Proposed Action) in the GNBPA.

The 6.07 trillion cubic feet (Tcf) of natural gas production over the life of the project under the Proposed Action is approximately equivalent to total production for a single year for the entire Mountain region (Utah, North Dakota, South Dakota, Montana, Wyoming, Idaho, Nevada, Colorado, Arizona, and western New Mexico). Alternatively, the average annual production under the Proposed Action would represent 3 to 4 percent of the annual regional production over the next two decades. Over the first 30 years of the project, the average annual production for the Proposed Action would be equivalent to approximately 40 to 45 percent of the 442 billion cubic feet annual gas production for the State of Utah in 2008.

Below is a summary of cumulative impacts for key resources:

- **Air Quality:** Cumulative impacts to air quality as predicted from modeling would remain below air quality standards under all alternatives except the Optimal Recovery Alternative, for which there is a potential to exceed the standard for ozone (75 parts per million). Cumulative visibility modeling shows that the No Action Alternative would dominate regional haze impacts at Class I areas, whereas incremental visibility impacts from the action alternatives would be less than 1.0 deciview (dv). Cumulative acid deposition as predicted from modeling would be below established comparative deposition values at all Class I and Class II areas within the vicinity of the GNBPA.
- **Range Resources:** The 12 grazing allotments that make up the CISA for range resources encompass an area of 470,228 acres. Total cumulative disturbance to these allotments, including

impacts from the Proposed Action, would be 37,261 acres; resulting in the loss of 3,149 active animal unit months (AUMs). The Proposed Action would account for 1,018 AUMs, or approximately 32 percent of the total cumulative AUMs lost. Under the Resource Protection Alternative, the proposed project would account for 655 AUMs lost (24 percent of the total cumulative loss); under the Optimal Recovery Alternative, the proposed project would account for 3,425 AUMs lost (62 percent of the total cumulative loss).

- **Vegetation:** The Proposed Action would represent approximately 48 percent of the 26,411 acres of cumulative vegetation loss; the Resource Protection Alternative would represent 37 percent of the 21,900 acres of cumulative vegetation loss; and the Optimal Recovery Alternative would represent 76 percent of the 56,373 acres of cumulative vegetation loss within the GNBPA. While cumulative surface disturbance, particularly linear disturbances such as pipelines, roads, transmission lines and seismic surveys, have the potential to spread noxious weeds and invasive species, these impacts would be minimized through the use of wash stations to control mechanical spreading of seeds, herbicide spraying, and reclamation of disturbed areas.
- **Water:** Cumulative impacts to surface water quantity due to past, present, and reasonably foreseeable oil and gas development activities would be minor because the majority of water use would be limited and short-term in nature as well as substantially less than other demands (particularly agricultural) in the Uintah County region. Compliance with spill prevention and clean-up programs, stormwater management plans, and construction best management practices would reduce cumulative impacts to surface water quality. Increased injection of produced water into subsurface saline aquifers would increase aquifer storage; however, due to implementation of the United States (U.S.) Environmental Protection Agency's Underground Injection Control program, impacts to underground sources of drinking water would not be anticipated.
- **Wildlife:** Cumulative impacts to wildlife resources would be directly related to habitat loss, habitat fragmentation, and animal displacement associated with increased surface disturbance. Within the CISA for wildlife and fisheries, the Proposed Action would represent approximately 15 percent of the 82,833 acres of cumulative surface disturbance; the Resource Protection Alternative would represent approximately 10 percent of the 78,322 acres of cumulative surface disturbance; and the Optimal Recovery Alternative would represent approximately 38 percent of the 112,795 acres of cumulative surface disturbance.

  Cumulative impacts to fisheries resources include erosion and sedimentation from increased surface disturbance, water depletions from the White and Green rivers, and the potential leaks and spills of contaminants from facilities or development activities. Due to the presence of federally endangered fish species in the White and Green rivers, these cumulative impacts would be minimized by the protection measures required by the BLM and U.S. Fish and Wildlife Service. Total water depletions of 757 acre-feet/year under the Proposed Action and Resource Protection alternatives, and 1,385 acre-feet/year under the Optimal Recovery Alternative, would account for less than 1 percent of the total water depletions (182,603 acre-feet/year) within the White and Green rivers.

Table ES-1 Disturbance Comparison for GNBPA Alternatives (Excluding Existing Condition)

New Facilities	Size (ROW width [feet] or acres/facility)	New Surface Disturbance by Alternative							
		No Action		Proposed Action		Resource Protection		Optimal Recovery	
		Multiplier (number or miles)	Disturbance (acres or % of GNBPA)	Multiplier (number or miles)	Disturbance (acres or % of GNBPA)	Multiplier (number or miles)	Disturbance (acres or % of GNBPA)	Multiplier (number or miles)	Disturbance (acres or % of GNBPA)
Roads									
Access Roads[1]	45 feet	276 miles	1,503	760 miles	4,147	594 miles	3,238	1,627 miles	8,875
Well Pads									
New Single Well Pads	2.5 acres	1,102 each	2,755	3,041 each	7,603	1,484 each	3,710	12,812 each	32,030
Twinned Well Pads (Additional Disturbance)	0.2 acre	0 each	0	634 each	127	634 each	127	634 each	127
Multi-well Pads (Additional Disturbance)	0.2 acre	0 each	0	0 each	0	1,557 each	311	0 each	0
Well Pad Subtotal		1,102 each	2,755	3,675 each	7,729	3,675 each	4,148	13,446 each	32,157
Construction/Production Facilities									
Mancamps	5 acres	0 each	0	2 each	10	2 each	10	2 each	10
Compressor Stations	20 acres	6 each	120	2 each	40	2 each	40	5 each	100
Water Tank Batteries	3 acres	8 each	24	2 each	6	2 each	6	5 each	15
Water Injection Facilities (Additional Disturbance)	0.2 acre	0 each	0.0	15 each	3	15 each	3	25 each	5
Construction/Production Facilities Subtotal			144		59		59		130
Linear Facilities									
Gas Gathering Pipelines – Common ROW	0 feet	262 miles	0	722 miles	0	564 miles	0	1,546 miles	0
Gas Gathering Pipelines – Cross-country	20 feet	14 miles	33	38 miles	92	30 miles	72	81 miles	197
Gas Transport Pipelines (Buried)	75 feet	0 miles	0	35 miles	318	35 miles	318	70 miles	636
Water Gathering Pipelines – Common ROW (Surface)	0 feet	0 miles	0	587 miles	0	458 miles	0	1,256 miles	0
Water Connecting Pipelines (Buried)	75 feet	26 miles	236	25 miles	227	25 miles	227	50 miles	455
Electric Power Lines	100 feet	2.5 miles	30	7 miles	85	7 miles	85	14 miles	170
Linear Facilities Subtotal			300		722		702		1,458
New Surface Disturbance (acre)			4,702		12,658		8,147		42,620
GNBPA New Disturbance (%)			2.9%		7.8%		5.0%		26.2%
No Action Alternative New Disturbance (acre)					4,702		4,702		4,702
Existing Surface Disturbance (acre)			7,766		7,766		7,766		7,766
Total Surface Disturbance (acre)			12,468		25,125		20,615		55,088
Total GNBPA Disturbed (%)			7.7%		15.4%		12.7%		33.8%
Surface Disturbance Interim Reclamation Estimates[2]									
Reclaimable New Surface Disturbance (acre)			1,753		4,731		3,387		13,189
Reclaimable No Action New Surface Dist (acre)					1,753		1,753		1,753
Reclaimable Existing Surface Disturbance (acre)			3,267		3,267		3,267		3,267
Total Est. Reclaimable Surface Disturbance (acre)			5,020		9,751		8,407		18,209
Reclaimable Surface Disturbance (%)			40.3%		39%		41%		33%
Reclaimable Surface Dist as % of GNBPA			3.1%		6.0%		5.2%		11.2%

[1] Assume access road length of 0.25 mile/well pad for No Action and Proposed Action; 0.4 mile/well pad for Resource Protection Alternative; 0.127 mile/well pad for Optimal Recovery Alternative.

[2] Interim reclamation estimates are based on the potential to reclaim 0.5 acre per new well pad, 27 feet ROW for new access roads, and all new Linear Facilities summarized in the table above.

Table ES-2 Impact Comparison by Resource for All Alternatives

Resource	No Action Alternative	Proposed Action Alternative	Resource Protection Alternative	Optimal Recovery Alternative	Additional Discussion
Air Quality					
Air Quality (exceed National Ambient Air Quality Standards)	No	No	No	Potential[1]	Section 4.1
Acid Deposition (exceed U.S. Forest Service threshold)	Yes (1 area)[2]	Yes (1 area)[2]	Yes (1 area)[2]	Yes (1 area)[2]	Section 4.1
Visibility (Class I)	Cumulative impacts > 1.0 dv	Incremental impacts < 1.0 dv	Incremental impacts < 1.0 dv	Incremental impacts < 1.0 dv	Section 4.1
Visibility (Class II)	Cumulative impacts > 1.0 dv	Incremental impacts > 1.0 dv at 2 areas	Incremental impacts > 1.0 dv at 2 areas	Incremental impacts > 1.0 dv at 2 areas	Section 4.1
Greenhouse Gas Emissions (10^3 tonne carbon dioxide equivalents/year)	1,761	2,754	2,754	5,485	Section 4.1
Cultural Resources and Native American Traditional Values					
Sites potentially encountered (incremental due to new surface disturbance)	52	142	90	475	Section 4.2
Geology					
Recoverable Gas Resources Over the Life of the wells (Tcf)	1.41	6.07	6.07	15.44	Section 4.3
Recoverable Condensate Resources Over the Life of the Wells (million barrels [bbl])	22.3	86.5	86.5	118	Section 4.3
Land Use					
White River Special Recreation Management Area (incremental acres disturbed)	7.8	49	32	164	Section 4.4
Paleontology					
Potential Fossil Yield Classification Class 4 or 5 areas (potential incremental acres disturbed)	4,467	12,025	7,740	40,489	Section 4.5
Range Resources					
AUMs Lost – BLM	352	947	609	3,186	**Tables 4.6-1**, **4.6-2**, **4.6-4**, and **4.6-6**
AUMs Lost – BIA	26	71	46	239	**Tables 4.6-1**, **4.6-2**, **4.6-4**, and **4.6-6**
Total AUMs Lost	378	1,018	655	3,425	
Number Rangeland Improvements Impacted (BLM land only)	NA	26	15	27	**Tables 4.6-3**, **4.6-5**, and **4.6-7**
Socioeconomics					
Energy Resource Recovery					Section 4.8 and **Table 4.8-1**
Natural Gas (Tcf)	1.41	6.07	6.07	15.44	
Oil Condensates (million bbl)	22.3	86.5	86.5	117.9	
Projected end of production (year)	2051	2059	2059	2066	
Employment (number jobs)					Section 4.8 and **Tables 4.8-5**, **4.8-9**, and **4.8-13**
Peak – development	1,790	4,302	4,302	9,024	
Average – production	239	875	875	1,712	
Population – Duchesne and Uintah counties					Section 4.8 and **Tables 4.8-6**, **4.8-10**, and **4.8-14**
Peak – development	2,585	5,590	5,590	8,368	
Average – production	450	1,508	1,508	2,732	

Table ES-2 Impact Comparison by Resource for All Alternatives

Resource	No Action Alternative	Proposed Action Alternative	Resource Protection Alternative	Optimal Recovery Alternative	Additional Discussion
Temporary and permanent housing demand in Duchesne and Uintah counties during development (units)	1,593	3,447	3,447	5,159	Section 4.8 and **Tables 4.8-6**, **4.8-10**, and **4.8-14**
Grazing – Reduction in annual cash farm receipts ($24 per AUM lost)	As much as $7,632 lost	As much as $24,432 lost	As much as $15,720 lost	As much as $82,200 lost	Section 4.8
Public Sector Revenues – Cumulative Life of Field[3] (millions of 2006 dollars)					Section 4.8 and **Tables 4.8-8**, **4.8-12**, and **4.8-16**
Ad Valorem Taxes	89.2	343.8	343.8	856.1	
Utah Severance Taxes	270.5	1,146.7	1,146.7	2,709.5	
Federal and Tribal Mineral Royalties	417.9	2,692.4	2,692.4	6,333.9	
State Public School Fund Royalties	158.9	673.1	673.1	1,582.5	
Combined Public Sector Revenues	1,154.3	4,856.0	4,856.0	11,481.0	
Percent Increase over No Action	N/A	321	321	895	
Soils					
High Constraint (incremental acres disturbed)	4,396	11,835	7,618	39,849	**Table 4.9-1**, **Appendix F**
Moderate Constraint (incremental acres disturbed)	141	380	244	1,279	
Low Constraint (incremental acres disturbed)	165	443	285	1,492	
Transportation and Access					
New Access Roads (miles)	276	760	594	1,627	Section 4.10
Increase in Traffic Volume at Full Production (total number vehicle miles)	0	20,948	20,948	59,162	Section 4.10
Number of Annual Incidents (mostly minor accidents and spills)	22	58	58	201	Section 4.10
Vegetation					
Uinta Basin hookless cactus potential preferred habitat (estimated incremental acres disturbed)	1,576	4,369	2,731	14,201	Section 4.11
Vegetation Type (estimated incremental acres disturbed)					**Tables 4.11-1**, **4.11-2**, **4.11-3**, **4.11-4**
Salt-desert shrubland	1,932	5,279	3,437	17,775	
Sagebrush shrubland	1,663	4,548	2,961	15,313	
Grassland	455	1,246	811	4,194	
Cliff/Canyon	217	593	386	1,997	
Riparian	143	189	29	637	
Pinyon-juniper woodland	82	225	147	758	
Agriculture	30	81	53	274	
Barren	178	490	319	1,650	
Developed	2	7	4	22	
Visual Resources					
Visual Resource Management Class II areas on federal lands (incremental acres disturbed)	0	91	58	305	Section 4.12
Incremental Disturbance Visible from (acres):					Section 4.12
Boaters on the White River	1,287	3,461	2,218	11,536	
Goblin City Overlook	140	377	242	1,257	

Table ES-2 Impact Comparison by Resource for All Alternatives

Resource	No Action Alternative	Proposed Action Alternative	Resource Protection Alternative	Optimal Recovery Alternative	Additional Discussion
Water Resources					
Surface Water Uses (acre-feet/year)	550	800	800	1,925	Section 4.13
100-year Floodplains (incremental acres disturbed)	325	288	0	1,510	Section 4.13
Wilderness Characteristics					
BLM White River Natural Area (incremental acres disturbed)	0	0	0	0	Section 4.14
Non-wilderness Study Area Lands with Wilderness Characteristics (estimated incremental acres disturbed)	81	217	139	724	Section 4.14
Wildlife Resources					
Big Game Habitat (estimated incremental acres disturbed)					**Tables 4.15-1**, **4.15-3**, **4.15-5**, and **4.15-7**
Pronghorn Year-long Crucial	3,183	10,264	6,607	34,562	
Pronghorn Year-long Substantial	67	179	116	604	
Mule Deer Year-long Crucial	553	1,488	958	5,011	
Mule Deer Winter Substantial	68	183	118	615	
Elk Winter Substantial	9	24	16	82	
Rocky Mountain Bighorn Sheep Year-long Crucial	781	2,103	1,354	7,082	
Bison Year-long Crucial Range	3,406	9,168	5,901	30,869	
Potential White-tailed Prairie Dog Habitat (estimated incremental acres disturbed)	4,258	11,644	7,581	39,206	Section 4.15
Greater Sage-grouse Habitat (estimated incremental acres disturbed)					**Tables 4.15-2**, **4.15-4**, **4.15-6**, and **4.15-8**
2.0 Mile Lek Buffer	442	1,190	766	4,007	
Nesting	675	1,817	1,169	6,117	
Brooding	1,782	4,797	3,088	16,153	
Winter	1,356	3,649	2,349	12,288	
Fisheries Resources					
Estimated total water depletions for life of the project (acre/feet)	2,270	7,571	7,571	27,700	Section 4.15

[1] 2006 meteorological data show modeled concentrations of ozone between 76 and 79 ppb; 2005 meteorological data show modeled concentrations of ozone below 76 ppb.

[2] Modeled deposition from action alternatives does not exceed Federal Managers' Air Quality Related Values Workgroup thresholds, except for Mesa Verde National Park, which is predicted to exceed thresholds for the No Action Alternative.

[3] The public sector revenue projections assume constant natural gas prices of $4.59/thousand cubic feet and $45/barrel for liquids. However, energy prices fluctuate over time. Actual sector revenues could be higher or lower than shown, depending on future prices and production. Such variance would affect all alternatives.

Acronyms and Abbreviations

°F	degrees Fahrenheit
µg/m^3	micrograms per cubic meter
ACEC	Area of Critical Environmental Concern
ACEPM	applicant-committed environmental protection measure
ADT	average daily traffic
AHPA	Archaeological and Historical Preservation Act of 1974
AIRFA	American Indian Religious Freedom Act of 1978
AMP	Allotment Management Plan
amsl	above mean sea level
AO	Authorized Officer
APD	Application for Permit to Drill
API	American Petroleum Institute
APLIC	Avian Power Line Interaction Committee
AQRV	Air Quality Related Value
ARPA	Archaeology Resources Protection Act of 1979
AUM	animal unit month
BA	biological assessment
bbl	barrels
BCC	Birds of Conservation Concern
Bcf	billion cubic feet
BHCA	Bird Habitat Conservation Area
BIA	Bureau of Indian Affairs
BLM	Bureau of Land Management
BMP	best management practice
BSC	biological soil crusts
Btu	British thermal unit
BWPD	barrels of water per day
CAA	Clean Air Act
CAGR	Compounded Annual Growth Rate
CCC	Civilian Conservation Corps
CDOW	Colorado Division of Wildlife
CDP	Census Designated Places
CEQ	Council on Environmental Quality

CFR	Code of Federal Regulations
CH_4	methane
CISAs	Cumulative Impact Study Areas
CMAQ	Community Multiscale Air Quality
CO	carbon monoxide
CO_2	carbon dioxide
CO_2e	carbon dioxide equivalents
COA	Condition of Approval
CWA	Clean Water Act
dBA	decibels on the A-weighted scale
dv	deciview
DWSPZ	drinking water source protection zone
EA	environmental assessment
EIA	Energy Information Administration
EIS	environmental impact statement
EO	Executive Order
ESA	Endangered Species Act
FEMA	Federal Emergency Management Agency
FLAG	Federal Land Managers' Air Quality Related Values Workgroup
FLMs	Federal Land Managers
FLPMA	Federal Land Policy and Management Act of 1976
FMR	federal mineral royalty
FOOGLRA	Federal Onshore Oil and Gas Leasing Reform Act of 1987
FY	Fiscal Year
GHG	greenhouse gas
GIS	Geographic Information System
GNBPA	Greater Natural Buttes Project Area
GWP	global warming potential
H_2S	hydrogen sulfide
HAP	hazardous air pollutant
hp	horsepower
IC	internal combustion
IPCC	Intergovernmental Panel on Climate Change
kg/ha-year	kilograms per hectare-year
km	kilometer
KMG	Kerr-McGee Oil & Gas Onshore LP

KOSLA	Known Oil Shale Leasing Areas
kV	kilovolt
MACT	Maximum Achievable Control Technology
MBTA	Migratory Bird Treaty Act
MCD	multi-county district
Mcf	thousand cubic feet
mg/L	milligrams per Liter
MLA	Mineral Leasing Act of 1920
MMbl	million barrels
MMcfd	million cubic feet per day
mmhos/cm	millimhos per centimeter
N_2O	nitrous oxide
NAAQS	National Ambient Air Quality Standards
NAGPRA	Native American Graves Protection and Repatriation Act of 1990
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act of 1986
NNSR	Non-attainment New Source Review
NO_2	nitrogen dioxide
NOI	Notice of Intent
NOS	Notice of Staking
NO_X	oxides of nitrogen
NPS	National Park Service
NRCS	Natural Resource Conservation Service
NRHP	National Register of Historic Places
NSO	No Surface Occupancy
NSPS	New Source Performance Standards
NWIS	National Water Information System
OHV	off-highway vehicle
OSEC	Oil Shale Exploration Company
PFYC	Potential Fossil Yield Classification
PIF	Partners in Flight
PILT	payments-in-lieu of taxes
PL	Public Law
PM	particulate matter
PM_{10}	particulate matter with an aerodynamic diameter of 10 microns or less
$PM_{2.5}$	particulate matter with an aerodynamic diameter of 2.5 microns or less

PMZ	Primary Management Zone
ppm	parts per million
ppmw	parts per million weight
PSD	Prevention of Significant Deterioration
PWR	Public Water Reserve
RAPPS	Reasonable and Prudent Practices for Stabilization
RDG	Resource Development Group
RFD	reasonably foreseeable development
RIP	Recovery and Implementation Program
RMP	Resource Management Plan
ROD	Record of Decision
ROW	right-of-way
RVs	recreational vehicles
SAAQS	State Ambient Air Quality Standards
SARA	Superfund Amendments and Reauthorization Act
scf	standard cubic feet
SHPO	State Historic Preservation Officer
SI	spark-ignition
SMA	surface management agencies
SO_2	sulfur dioxide
SPCCP	Spill Prevention, Control, and Countermeasures Plan
SR	State Road
SRMA	Special Recreation Management Area
SSA	sole source aquifer
SSD	Special Service District
SSURGO	Soil Survey Geographic
SSXPII	Southern System Extension II
STATSGO	General Soil Map
STSA	Special Tar Sand Areas
SWPPP	Storm Water Pollution Prevention Plan
SWReGAP	Southwest Regional Gap Analysis Project
Tcf	trillion cubic feet
TDS	total dissolved solids
TEG	tri-ethylene glycol
tpy	tons per year
TSS	total suspended solids

UCAT	Utah College of Applied Technology
UDAQ	Utah Division of Air Quality
UDEQ	Utah Department of Environmental Quality
UDNR	Utah Department of Natural Resources
UDOGM	Utah Division of Oil, Gas, and Mining
UDOT	Utah Department of Transportation
UDOWS	Utah Department of Workforce Services
UDWR	Utah Division of Wildlife Resources
UGOPB	Utah Governor's Office of Planning and Budget
UGS	Utah Geologic Survey
UIC	Underground Injection Control
UNHP	Utah Natural Heritage Program
UNPS	Utah Native Plant Society
UPDES	Utah Pollution Discharge Elimination System
U.S.	United States
USACE	U.S. Army Corps of Engineers
USC	United States Code
USCA	United States Code Annotated
USDA	U.S. Department of Agriculture
USDOE	U.S. Department of Energy
USDOI	U.S. Department of the Interior
USDOT	U.S. Department of Transportation
USDW	underground source of drinking water
USEPA	U.S. Environmental Protection Agency
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
USITLA	Utah School and Institutional Trust Lands Administration
VOC	volatile organic compound
VRM	Visual Resource Management
WIC	Wyoming Interstate Company
WMU	wildlife management unit
WRAP	Western Regional Air Partnership
WSA	wilderness study area

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1.0 Introduction and Background

1.1 Project Location and Background

Kerr-McGee Oil & Gas Onshore LP (KMG), a wholly owned subsidiary of Anadarko Petroleum Corporation, has notified the Bureau of Land Management's (BLM) Vernal Field Office that it proposes to conduct infill drilling to develop the hydrocarbon resources from oil and gas leases owned, at least in part, by KMG within the Greater Natural Buttes Project Area (GNBPA) in Uintah County, Utah (**Figure 1.1-1**). KMG intends to explore and develop all potentially productive subsurface formations underlying the GNBPA. The formations include, but are not limited to, the Green River Formation, Wasatch Formation, Mesaverde Group (including the Blackhawk Formation), Mancos Shale, and Dakota Sandstone. KMG owns contractual leasehold rights for more than 85 percent of the lands within the GNBPA. In most cases, KMG's lease rights include the right to occupy the surface to explore, develop, operate, and produce the subsurface oil and gas resources.

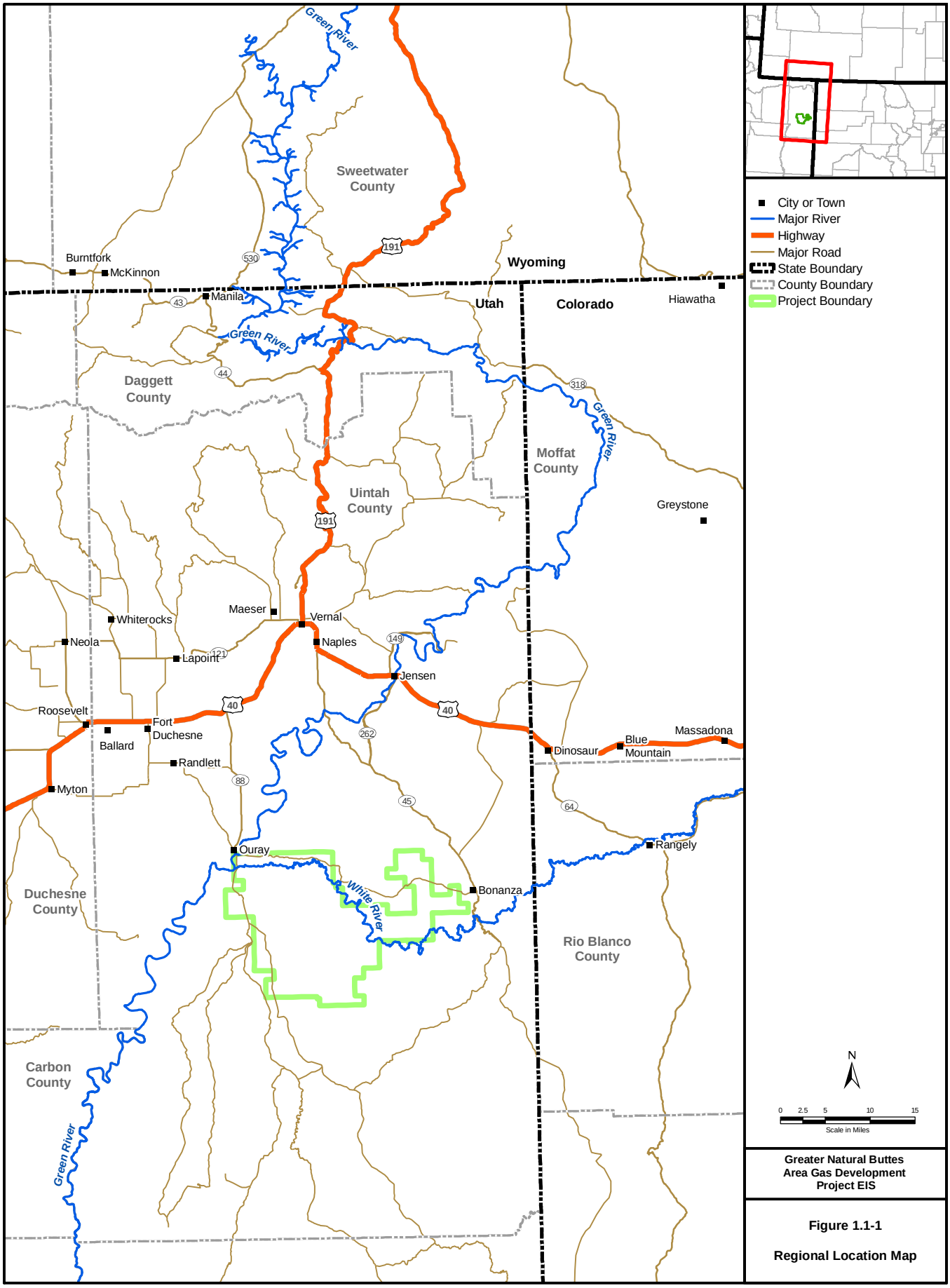
The GNBPA consists of approximately 162,911 acres in an existing gas producing region (Township 8 South, Range 20-23 East; T9S, R20-24E; T10S, R20-23E; and T11S, R21-22E) located on lands owned by the federal government, the State of Utah, the Ute Tribe, and other private land owners. The GNBPA includes portions of at least nine oil and gas fields, most of which are included in the larger Natural Buttes Field, currently the most productive gas field in Utah (**Figure 1.1-2**). The oil and gas fields located within the GNBPA are the Devil's Playground Field, the Love Field, the Natural Buttes Field, the Southman Canyon Field, the Uintah Field, the Chapita Wells Field, the Bitter Creek Field, the Ouray Field, and the Stagecoach Field.

Federal lands in the proposed GNBPA are under the jurisdiction of the BLM Vernal Field Office. The Vernal Field Office has determined that the proposed project constitutes a major federal action requiring the development of an environmental impact statement (EIS). This EIS serves the purpose of disclosing and analyzing impacts resulting from the level of development proposed within the GNBPA, including a no action alternative, with consideration of identified and applied applicant-committed environmental protection measures (ACEPMs), the BLM best management practices (BMPs), and identified mitigation measures. A summary of these ACEPMs is provided in **Appendix A**.

1.2 Summary of Proposed Action

KMG's proposed infill drilling project within the GNBPA (the Proposed Action) is the subject of the analysis contained in this EIS. KMG and other operators would explore and develop potentially productive subsurface formations underlying the GNBPA by drilling up to 3,675 additional wellbores from up to 3,041 new well pads over a period of 10 years. The productive life of each well is estimated to be approximately 30 to 50 years. In support of the new wells, KMG would construct access roads, pipelines, electric power lines, compression facilities, and water disposal facilities. The total estimated new surface disturbance for the Proposed Action would be approximately 12,658 acres or about 7.8 percent of the GNBPA.

Infill drilling would be performed on 40-acre and 20-acre surface spacing throughout the GNBPA, which is equivalent to a density of 16 to 32 surface well pads per section (or square mile). KMG defines a 40-acre well pad as the first well pad located in a governmental 40-acre quarter-quarter section. A 20-acre well pad is defined as the second well pad located in a 40-acre quarter-quarter section. Downhole or subsurface spacing would be based on the ongoing reservoir engineering evaluation and would be site-dependent, potentially ranging from 16 wells per section (40-acre spacing) to 64 wells per section (10-acre spacing) or more.



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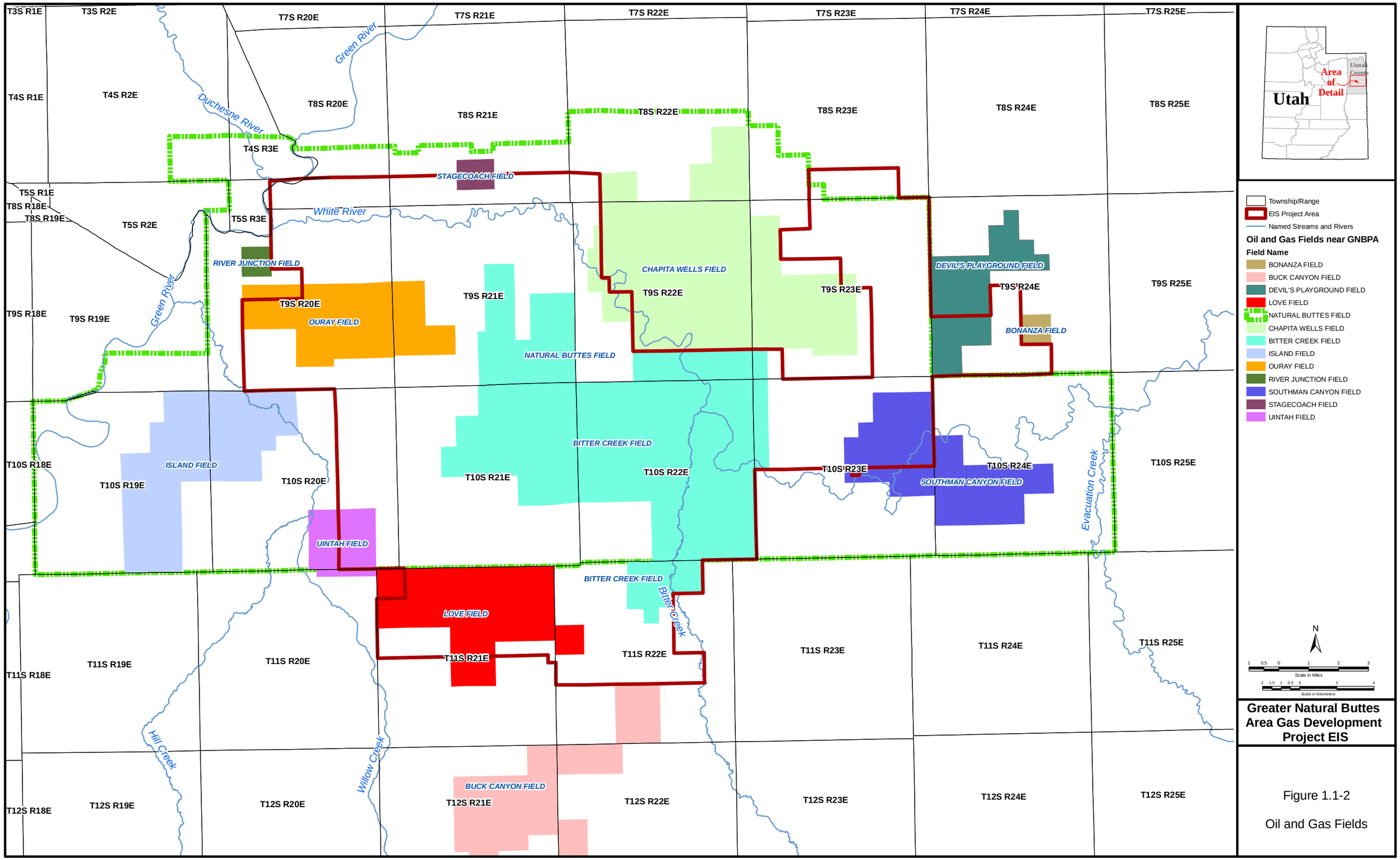

Greater Natural Buttes Area Gas Development Project EIS

Figure 1.1-2

Oil and Gas Fields

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KMG is a private corporation intending to make a profit through development of their leases in the GNBPA. Specific purposes for KMG's proposed project are to:

- Conduct infill drilling on 40-, 20-, and 10-acre downhole spacing to determine the efficiency of reservoir drainage of the various spacings;
- Determine whether directional drilling would be technically and economically feasible for achieving desired downhole spacing and for producing from tight gas reservoirs in environmentally constrained areas;
- Increase the available supply of domestically produced natural gas by a daily delivery of 500 million cubic feet or greater;
- Increase the available supply of domestically produced liquid hydrocarbons;
- Support local economies by providing and maintaining employment opportunities, sustaining local businesses, and expanding the tax base;
- Reduce dependence on potentially unstable foreign sources of energy and contribute to our nation's energy security; and
- Contribute to the available supply of a clean-burning fuel for domestic and industrial use.

In addition, KMG's proposed natural gas and oil development project is consistent with the National Energy Act of 2005 and the National Energy Policy (President's Plan) because it would provide a domestic source of natural gas and oil to meet the rising national energy demand.

1.3 Purpose and Need

The need for a BLM action is to respond to this proposal and to evaluate potential impacts resulting from implementing future plans and applications related to this proposal. The Federal Land Policy and Management Act of 1976 (FLPMA) (Public Law [PL] 94-579, 43 United States Code [USC] 1701 et seq.) recognizes oil and gas development as one of the "principal" uses of the public lands. Federal mineral leasing policies (Mineral Leasing Act of 1920 [MLA], 30 USC 188 et seq.) and the regulations by which they are enforced recognize the statutory right of lease holders to develop federal mineral resources to meet continuing national needs and economic demands. The purpose of this EIS is to facilitate the BLM decision-making process whether to approve, approve with modifications, or disapprove the proposed project or project components based on an evaluation of the expected impacts. Through this process, the BLM's purpose is to minimize or avoid environmental impacts to the extent possible, while allowing KMG to exercise its valid lease rights.

1.4 Environmental Analysis Process

This EIS was prepared in accordance with the National Environmental Policy Act (NEPA) and in compliance with the FLPMA, Council of Environmental Quality (CEQ) regulations (40 Code of Federal Regulations [CFR] Parts 1500-1508), United States (U.S.) Department of the Interior (USDOI) requirements (Department Manual 516, Environmental Quality, including amendments under 40 CFR Part 46), and guidelines listed in the BLM NEPA Handbook, H-1790-1 (BLM 2008a) and in the BLM Utah NEPA Guidebook (BLM 2006a).

According to the terms of the MLA as amended by the Federal Onshore Oil and Gas Leasing Reform Act of 1987 (FOOGLRA), the BLM is the agency authorized to manage federal mineral interests underlying federal or split estate lands. Approximately 54 percent of the surface of the GNBPA and 79 percent of the mineral interests underlying the GNBPA are owned by the United States and administered by the BLM. Therefore, the BLM is the lead agency in this process, and federal jurisdiction of the GNBPA natural gas development project is assumed by the BLM, which would issue a Record of Decision (ROD) for this EIS.

Within the ROD, the BLM Authorized Officer (AO) would determine:

- Whether the analysis contained within this document is adequate for the purpose of reaching informed decisions regarding GNBPA project development;
- Whether to approve the Proposed Action, select a different alternative, or a combination of alternatives;
- Whether the Proposed Action or other alternatives are in conformance with applicable land and resource management plans and programmatic plans developed under NEPA, FLPMA, CEQ regulations, USDOI Department Manual 516, and the BLM NEPA Handbook H-1790-1 (BLM 2008a); and
- The Conditions of Approval (COAs), if any, that may be attached to the ROD.

The BLM decision would only apply to federal lands; however, the analyses in this EIS consider the impacts for all proposed activities regardless of surface ownership.

Uintah County and the Bureau of Indian Affairs (BIA) are cooperating agencies. Copies of the Preliminary Draft EIS were submitted to Uintah County and the BIA for their review and comment prior to distribution to the public, and their comments were taken into account.

1.4.1 Decisions to be Made After the EIS Process

Although the ROD may approve the proposed oil and gas wellfield development on a conceptual basis, a site-specific environmental review of areas proposed for surface disturbance and sub-surface mineral extraction would be completed to determine the final location of facilities based on environmental considerations. Prior to drilling on BLM-administered land, the project proponent must submit an Application for a Permit to Drill (APD) to the BLM, which includes a Surface Use Plan of Operation and a Drilling Plan. At that time, the BLM would conduct a site-specific NEPA review and attach appropriate measures to the permit to protect natural and human resources. The BLM is responsible for approval of the drilling program, protection of groundwater and other sub-surface resources, and final approval of the APD on BLM-administered lands and/or minerals. Access roads and utilities such as pipelines and electrical powerlines on federal lands may require a right-of-way (ROW) grant from the BLM, based on the APD applications or other independent applications. The regulations and guidelines that are used to administer the construction and operation of oil and gas facilities are further discussed in Section 2.3, Management Common to All Alternatives.

Tribal surface and mineral estate is administered in trust by the BIA. While the BLM would approve drilling permits on Tribal Lands, approval of surface disturbance and granting of ROWs would be approved by the BIA. All lands belonging to the State of Utah within the GNBPA are administered by the Utah School and Institutional Trust Lands Administration (USITLA). USITLA issues oil and gas leases and would approve surface disturbance activities on state lands. Approval of APDs on state and privately owned lands would be subject to requirements of the Utah Division of Oil, Gas, and Mining (UDOGM).

1.5 Legal and Policy Considerations

1.5.1 Leases and Leasing History

KMG operates the oil and gas leases underlying approximately 85 percent of all lands in the GNBPA. For those leases where KMG is the designated operator, KMG is responsible for ensuring that lease stipulations are followed during oil and gas development.

Many of the leases covering BLM-administered minerals within the GNBPA were issued before the current Resource Management Plan (RMP) for the project area was approved and, therefore, may not contain

stipulations other than the standard lease terms. Typical stipulations that may apply to federal oil and gas leases in the vicinity of the GNBPA include:

- Stipulations to protect lands in oil shale withdrawal, Executive Order (EO) 5327 of April 15, 1930;
- Surface disturbance restrictions to protect erosive soils and sensitive plants;
- Seasonal restrictions to protect raptor species and other wildlife;
- Threatened and Endangered Species Act of 1973 (ESA) stipulations; and
- Protection of cultural resources.

Surface stipulations and timing restrictions, threatened and endangered species lease notices for oil and gas development, and BLM-committed conservation measures that may apply to federal leases within the GNBPA are provided in the Vernal Field Office ROD and Approved RMP (BLM 2008b).

1.5.2 Conformance with BLM Management Plans and Policies

Policies for development and land use decisions for federal lands and minerals within the GNBPA are contained in the following federal documents.

- The Vernal Field Office ROD and Approved RMP (BLM 2008b)
- Environmental Analysis Record Oil and Gas Leasing Program for the Vernal District (BLM 1975)

Additional guidance for the GNBPA is contained in the following NEPA documents.

- The Vernal Field Office Proposed RMP and Final EIS (BLM 2008c)
- EA No. 1997-13, Coastal Oil & Gas Corporation Natural Buttes Unit Environmental Assessment (EA), Uintah County, Utah (BLM 1997a)
- Final EA of Coastal's Proposed Development of the Ouray Field, Uintah County, Utah (Buys & Associates 2000)
- EA No. UT-080-2006-240, Kerr-McGee's Bonanza Area EA (BLM 2006b)
- EA No. UT-080-2006-253, Kerr-McGee's Love Unit EA and Biological Assessment (BA) (BLM 2006c)
- EIS No. UT-080-2005-0010, EOG Resources' Chapita Wells-Stagecoach Area EIS and BA (BLM 2008d)
- EIS No. UT-080-2003-0369V, Questar Exploration and Production Company's Greater Deadman Bench EIS (BLM 2008e)

Management objectives within the Vernal RMP ROD include leasing oil and gas resources while protecting or mitigating impacts to other resource values. As such, the proposed GNBPA natural gas development project is consistent with the management decisions contained in the RMP. It is noted that surface occupancy or some existing oil and gas leases may not be in conformance with the Vernal RMP because existing lease terms are not affected by the recently approved RMP. To the extent feasible, the proposed project would be expected to comply with the BLM's Utah Public Lands Health Standards (BLM 1997b). The proposed project also would be required to comply with federal policies related to riparian habitats, floodplains, and drainages.

1.5.3 Consistency with Other Federal and Local Land Management Plans and Policies

The BIA is a cooperating agency on this EIS. A formal management plan does not exist for the Uintah and Ouray Reservation; however, the elected Ute Tribe Business Committee and the BIA determine approval of land use activities on Tribal Lands. Production from tribal leases provides royalties, tax revenues, and surface

access and use fees to the Tribe, which contributes to the Tribe's economic well being. The Proposed Action is consistent with the regulatory responsibilities of the BIA, which include promoting the economic development objectives of the Ute Tribe under its government-to-government relationship with, and trust responsibility to, the Tribe. Therefore, the range of the BIA's reasonable alternatives is limited to those that would serve the Tribe's economic development objectives consistent with the trust responsibility.

There are no comprehensive State of Utah plans for the GNBPA. USITLA has leased all of the state lands within the GNBPA for oil and gas production. Because the main objective of USITLA is to produce funding for the state school system, and because production on federal leases could lead to further interest in drilling state leases in the area, the Proposed Action is assumed to be consistent with the objectives of USITLA.

Uintah County has developed a Uintah County General Plan (Uintah County 2005) regarding development on public lands within the County. The Uintah County General Plan emphasizes multiple-use public land management practices, responsible use, and optimum utilization of public land resources. Multiple-use is defined in the plan as including, but not limited to, the following historically and traditionally practiced resource uses: grazing, recreation, timber, mining, oil and gas development, agriculture, wildlife habitat, and water resources. The proposed project is consistent with the Uintah County General Plan.

1.5.4 Authorizing Actions and Project Relationships to Statutes and Regulations

Private exploration and production from federal oil and gas leases is an integral part of the BLM oil and gas leasing program under authority of the MLA and FLPMA. The BLM oil and gas leasing program encourages development of domestic oil and gas reserves in accordance with the Mining and Minerals Policy Act and the reduction of U.S. dependence on foreign energy sources. Natural gas is an integral part of the energy future for the U.S. due to its availability and the presence of an existing market delivery infrastructure. The environmental advantages of burning natural gas, rather than coal, were emphasized by the U.S. Congress and by the President when the Clean Air Act (CAA) Amendments of 1990 were signed into law. Furthermore, the Energy Policy acts of 2001 and 2005 emphasize the development of domestic natural gas reserves for supply and economic stability.

Various aspects of oil and gas development are regulated under the BLM Onshore Oil and Gas Orders, as authorized in 43 CFR 3160 including:

- Onshore Order No.1 – Approval of Operations;
- Onshore Order No. 2 – Drilling Operations;
- Onshore Order No. 3 – Site Security;
- Onshore Order No. 4 – Measurement of Oil;
- Onshore Order No. 5 – Measurement of Gas;
- Onshore Order No. 6 – Hydrogen Sulfide Operations;
- Onshore Order No. 7 – Disposal of Produced Water;
- Onshore Order No. 8 – Well Completions/Workovers/Abandonment (Proposed Rule);
- Onshore Order No. 9 – Waste Prevention and Beneficial Use of Oil and Gas (Not Published); and
- Notices to Lessees.

In addition to the BLM, numerous other federal, state, and local governmental agencies may be involved in regulation of oil and gas development. A summary of the key permits, approvals, and authorizing actions that may apply to the action alternatives is provided in **Table 1.5-1**.

Table 1.5-1 Key Federal, State, and Local Permits, Approvals, and Authorizing Actions for Construction, Operation, Maintenance, and Abandonment of the Proposed Action

Issuing Agency	Name and Nature of Permit/Approval	Regulatory Authority (if appropriate)
FEDERAL AGENCIES		
USDOI BLM	Permit to Drill, Deepen, or Plug Back (APD/Sundry Process); Controls drilling for oil and gas on federal onshore lands. Also see Chapter 2.0, **Table 2.3-1**.	MLA (30 USC 181 et seq.); 43 CFR 3162; National Mining and Minerals Policy Act of 1970, the FOOGLRA of 1987, (Onshore and Gas Orders #1 and #2 [43 CFR 3164])
	ROW Grants and Temporary Use Permits; grants ROW use on BLM-managed lands.	MLA as amended (30 USC 185); 43 CFR 2880; FLPMA (43 USC 17611771); 43 CFR 2800
	Antiquities, Cultural, and Historic Resource Permits; issue antiquities and cultural resources use permits to inventory, excavate, or remove cultural or historic resources from federal lands.	Antiquities Act of 1906 (16 USC Section 431-433); Archaeological Resources Protection Act of 1979 (ARPA) (16 USC Sections 470aa47011); 43 CFR Part 3; Section 106 of the National Historic Preservation Act (NHPA)
	Approval to dispose of produced water; controls disposal of produced water from federal leases. Also see Chapter 2.0, **Table 2.3-1**.	MLA (30 USC 181 et seq.); 43 CFR 3164; Onshore Oil and Gas Order No. 7
	Pesticide Use Permit and Daily Pesticide Application Record.	BLM Authorization for Herbicide Applications on Federal Lands
	Federal Noxious Weed Act compliance.	Plant Protection Act of 2000 (PL 106-224, 7 USC 7701); Federal Noxious Weed Act of 1974, as amended (USC 2801-2814); EO 13112 of February 3, 1999
	Initiation of Section 7 consultation.	Section 7 of the ESA, as amended (16 USC et seq.)
	Mineral Material Sales Permit; for use of BLM-managed borrow pits in road construction.	Materials Act of 1947 as amended (30 USC, 601 et seq.)
	Paleontological Resource Use Permit; approval for surveys and potential data collection at well pads and road sites.	FLPMA (302[b])
BIA	ROW Grants and Temporary Use Permits; grants ROW use on Tribal Lands.	25 CFR 169
	Tribal/allotted Land Activities. In coordination with the Northern Ute Tribe, the BIA has authority to approve any and all activities on Tribal/allotted lands.	25 CFR 225
U.S. Fish and Wildlife Service (USFWS)	ESA Section 7 consultation.	Section 7 of the ESA, as amended (16 USC et seq.)
	Migratory Bird Treaty Act (MBTA) consultation.	MBTA of 1918, as amended (15 USC 703-712); EO 13186
	Bald and Golden Eagle Protection Act consultation.	Bald Eagle Protection Act of 1940, as amended (16 USC 668-668d)
	Section 404 Permit Consultation; review of permit for compliance with ESA.	Consultation as established under the Fish and Wildlife Coordination Act
Advisory Council on Historic Preservation	Cultural resources compliance (Section 106); coordinated with the Utah State Historic Preservation Officer (SHPO).	NHPA, Section 106
U.S. Department of Defense Army Corps of Engineers (USACE) – *Sacramento District*	Section 404 permit (Nationwide and Individual); controls discharge of dredged or fill materials into waters of the U.S.	Section 404 of the Clean Water Act of 1972 (CWA) (33 USC 1344)
U.S. Environmental Protection Agency (USEPA) Region 8	USEPA is required to review and comment on major federal actions that have a significant impact on the human environment. In addition, the northwestern portion of the GNBPA lies within the tribal boundary established by the 10th Circuit Court. USEPA has responsibility for implementing environmental programs for Indian Country (as defined at 18 USC § 1151) until Tribal governments are formally authorized to implement these programs. USEPA's role is to provide scoping comments, review EISs, and provide CAA and CWA permitting, information, and appropriate technical assistance during and following the environmental analysis process.	CAA, as amended, 42 USC Annotated (USCA) Section 7410-762 (PL 95-604, PL 95-95) Federal Water Pollution Control Act, as amended by the CWA, 33 USCA Section 1251-1376 (PL 92-500, PL 95-217) Safe Drinking Water Act, 452 USCA Section 300F-300J-10 (PL 93-523)
	Underground Injection Control (UIC) – also see Chapter 2.0, **Table 2.3-1**.	UIC (40 CFR 146.21 through 146.24)

Table 1.5-1 Key Federal, State, and Local Permits, Approvals, and Authorizing Actions for Construction, Operation, Maintenance, and Abandonment of the Proposed Action

Issuing Agency	Name and Nature of Permit/Approval	Regulatory Authority (if appropriate)
U.S. Department of Transportation (USDOT) Utah	Approval of construction and operation of natural gas pipelines. Prescribes minimum safety requirements for pipeline facilities and the transportation of natural gas.	Pipeline safety regulations (49 CFR 190-199)
STATE AGENCIES		
Utah Division of State History Utah SHPO	Consult on Section 106 compliance process; approve cultural resource clearances; provide for protection of cultural resources.	NHPA, Section 106
	Antiquities Annual Permit; to conduct archeological surveys on state and private lands.	Archaeological Permit Rules Utah R694-1
	Antiquities Projects Permit; regulates all archeological excavations on state and private lands.	Archaeological Permit Rules Utah R694-1
Utah Department of Natural Resources (UDNR) UDOGM	Regulates activities associated with drilling of oil and gas wells in state, including pressure monitoring and permitting of injection wells and well spacing – also see Chapter 2.0, **Table 2.3-1**.	Permitting of Wells, Utah R649-3-4 et seq., R649-3-18; UIC Rules Utah R649-5 and R649-3-2
Division of Water Rights	Review and issuance of stream alteration permit.	Utah Code 73-3-29
	Approval to Appropriate Water; grants permit to appropriate water.	Utah Code 73-3-2
Division of Water Resources	Determination of adequate water supply and cumulative impacts on water supply. Section 401, CWA Water Quality Certification Stream and Wetland Crossings Section 401, CWA Water Quality Certification Stream and Wetland Crossings.	CWA as it pertains to state government (Section 401)
Utah Division of Wildlife Resources (UDWR)	Protection and management of state wildlife and fish resources. Participation in the Section 404 Permit process and review of the Draft EIS.	Utah Code 23-22
	Consultation and input on fish and wildlife habitat for state listed species.	Utah Code 23-13 through 23-21
Forestry, Fire, and State Lands	ROW grant for construction activities on State lands.	Easement Rules Utah R652-40
Utah Department of Environmental Quality (UDEQ) Division of Water Quality	Protection of water quality. Responsible for the Utah Pollutant Discharge Elimination System (UPDES) storm water discharge permit. Prior to construction the preparation of a Storm Water Pollution Prevention Plan (SWPPP) is required.	Utah Code 19-5; UPDES Rules Utah R317-8
	UPDES Construction Dewatering Permit; discharge of dewatering and hydrostatic test waters from property to U.S. waters.	Utah Code 19-5; UPDES Rules Utah R317-8
Division of Air Quality	Approval order; permit for operation of certain stationary emissions sources; Air Quality Permit to Construct.	Utah Code Stationary Source Rules Utah R307-210; Operating Permit Rules Utah R307-415
	New Source Review Permit; controls emissions from new or modified sources.	New and Modified Source Permit Rules Utah R307-401
	Fugitive Dust Control.	Fugitive Dust Rules Utah R307-205
Utah Department of Transportation (UDOT)	Transport Permit; authorizes oversize, over length, and overweight load transportation on state highways.	Motor Carrier Rules Utah R909-1
	Encroachment Permit; authorizes pipeline crossings of access roads that tie into state or federal highways.	Access Openings Rules Utah R933-3
USITLA	Issue a ROW grant/permit for construction and use activities on State Trust Lands.	USITLA Rights-of-Entry Rules Utah R850-41
LOCAL AGENCIES		
Uintah County Commissioners	County zoning/land use plan consultation.	Uintah County Code, Uintah County General Plan (Uintah County 2005)
	Road Use and Opening permits.	Uintah County Code
	Construction permits, licenses.	Uintah County Code
	Noxious Weed Act enforcement.	Uintah County Code
	Solid Waste Disposal permits.	Uintah County Code
	Special Use and Conditional Use permits.	Uintah County Code

1.6 Scoping

1.6.1 Public Scoping

The BLM conducted public and internal scoping to solicit input and identify environmental issues and concerns associated with the proposed project. The public scoping process was initiated on October 5, 2007, with the publication of a Notice of Intent (NOI) in the Federal Register. The BLM prepared a scoping information notice and provided copies to the public, other government agencies, and Tribes. These announcements included information on a public scoping and open house, which was held at the Western Park Conference Center in Vernal, Utah, on October 23, 2007. The official scoping period ended November 5, 2007.

Written comments were received during the public scoping period. Public response to the NOI and meetings included a total of nine letters: two from federal agencies, one from the state agencies, one from a county agency, one from a non-government organization, and four from industry or private individuals.

During the scoping period, the following key concerns were identified for consideration in preparing the Greater Natural Buttes EIS.

- Analysis of proposed development throughout the GNBPA in a manner compatible with previous or ongoing NEPA projects covering portions of the proposed GNBPA.
- Off-site mitigation opportunities or other management options.
- Laws, regulations, or BLM policies that may have changed since the Book Cliffs RMP.
- Impacts associated with tribal trust resources.
- Detailed transportation analysis that identifies methods to reduce traffic during drilling and production, defines maintenance standards, and determines the ultimate disposition of roads at project termination.
- Generation of solid wastes including garbage and human waste.
- Disposal of produced water on-site, use of produced water in drilling and fracing operations, and use of gathering water with pipelines versus trucking water to disposal sites.
- Comprehensive reclamation plan that includes post-reclamation monitoring and annual reporting.
- Additional surface disturbance associated with pipelines and analysis of surface versus sub-surface pipelines.
- Feasibility of locating production facilities outside the 100-year floodplain.
- Comprehensive air-quality analyses and region-wide air-quality modeling.
- Direct and cumulative impacts to pronghorn population, forage availability, and ability of numbers to meet herd unit objectives.
- Direct and cumulative impacts to sage grouse leks and surrounding nesting and brood-rearing habitats with consideration of mitigative habitat restoration and other mitigation measures.
- Cumulative impacts on current grazing permits, including direct impacts to livestock, forage, water developments, and economic returns.
- Identification of hunting value of lands in the GNBPA and impacts to hunting activities.
- Impacts to visual resources and recreational use along the White River.
- Economic effects of the proposed project to the local economy, the state, and the school trust lands.
- Balance between environmental protection and economic growth.

1.6.2 Internal Scoping and Issue Identification

The BLM has compiled a list of resources potentially present in the Vernal Field Office area. These resources represent issues considered in all Vernal Field Office EAs and EISs and are discussed and analyzed in Chapters 3.0, 4.0, and 5.0 of this document. A listing of these resources and their status within the GNBPA is presented in **Appendix B**. The resources and issues identified in this appendix that are not within the vicinity of the GNBPA, and therefore would not be affected by the proposed project, are not carried forward for detailed analysis in Chapters 3.0, 4.0, and 5.0 of this EIS.

2.0 Proposed Action and Alternatives

This chapter defines the GNBPA boundaries, describes the existing and approved oil and gas facilities present within the GNBPA (Section 2.2), discusses standard development and production activities (Section 2.5), and describes the alternatives analyzed in this document. In developing the alternatives, the BLM followed guidance set forth in the BLM Instruction Memorandum No. 2005-247, Attachment 1, which provides recommendations on developing a range of reasonable alternatives for oil, gas, and geothermal development activities. Based on this guidance, the BLM developed the following alternatives for analysis in this EIS.

- **No Action Alternative:** This alternative assumes that approval of KMG's proposed project is denied and no new drilling would occur on Federal mineral estate except that currently permitted and approved under previous NEPA documents (Section 2.4).
- **Proposed Action Alternative:** This alternative consists of KMG's proposal to develop an additional 3,675 wells drilled from a maximum of 3,041 new well pads placed at up to 20-acre surface spacing within the GNBPA (Section 2.6).
- **Resource Protection Alternative:** This alternative consists of the same number of subsurface wells as the Proposed Action Alternative drilled from a reduced number of well pads (approximately 1,484) at 40-acre surface spacing to reduce the surface disturbance of the project (Section 2.7). Directional drilling would need to be used under this alternative to achieve the same number of subsurface wells (3,675) as the Proposed Action Alternative from a reduced number of surface well pads. The Resource Protection Alternative is the BLM preferred alternative.
- **Optimal Recovery Alternative:** This alternative maximizes the recovery of natural gas resources by increasing well surface spacing to 10 acres for an estimated 13,446 wells within the GNBPA (Section 2.8).

The No Action Alternative and each of the various action alternatives are discussed in terms of alternative-specific activities and schedule, alternative-specific design features, and surface disturbance summaries. Alternatives considered but eliminated from detailed analysis are discussed in Section 2.9. The analysis of each alternative in Chapter 4.0 focuses on the new disturbance that would occur under each alternative.

2.1 Greater Natural Buttes Project Area

KMG and other operators active in the GNBPA continue to implement approved oil and gas development including drilling new wells and constructing new infrastructure. Additionally, KMG proposes to drill new wells as infill to all productive formations, including but not limited to, the Green River Formation, Wasatch Formation, Mesaverde Group (including the Blackhawk Formation), Mancos Shale, and Dakota Sandstone. Target depths for the wells throughout this area would range from approximately 2,000 to 16,000 feet, with the primary focus on 2 formations: the Wasatch Formation where the wells would range from 2,400 to 6,500 feet deep and the Mesaverde Group where they would range from 3,900 to 11,000 feet deep. The total number of wells drilled and yearly drilling activity would depend largely on factors outside of KMG's control such as production success, engineering technology, reservoir characteristics, economic factors, commodity prices, rig availability, and lease stipulations.

The GNBPA consists of approximately 162,911 acres in an existing gas producing area located in T8S, R20-23E; T9S, R20-24E; T10S, R20-23E; and T11S, R21-22E in Uintah County, Utah. The lands included in the GNBPA are located in all or a portion of the townships illustrated in **Figure 1.1-2**.

The number of wellbores on any particular surface location or pad would vary according to KMG's success in deepening existing wellbores to the Mesaverde Formation as well as the ability to drill viable directional wellbores in environmentally constrained areas.

The project wells and facilities would be constructed and operated within the GNBPA on lands owned by the federal government, the State of Utah, private landowners, and lands held in trust for the benefit of the Ute Tribe. Tribal allottees are individual Native Americans who received land and sometimes mineral interests directly from the federal government. Lands with separate surface and mineral ownership, so called "split estate lands," comprise approximately 18 percent of land within the GNBPA. Surface ownership and ownership of oil and gas mineral rights are summarized in **Table 2.1-1**.

Table 2.1-1 Surface and Oil and Gas Minerals Ownership within the GNBPA

Surface Owner	Surface Acres	Percentage	Minerals Acres[1]	Percentage
BLM	88,565	54.4	117,116	71.9
Ute Indian Tribe	39,399	24.2	10,855	6.7
State of Utah	32,755	20.1	32,685	20.1
Private[2]	2,192	1.3	2,255	1.4
Totals	162,911	100	162,911	100

[1] Mineral ownerships reflect relative accuracy only.
[2] Includes allottees.

2.2 Existing Oil and Gas Infrastructure in the GNBPA

Based on UDOGM information (October 2007) for existing oil and gas infrastructure in the GNBPA, 1,562 vertical productive wells have been drilled on single well pads and are in operation. **Table 2.2-1** identifies those existing or approved oil and gas facilities that are present within the GNBPA.

Table 2.2-1 Existing Facilities

Facility	Multiplier (number or miles)	Size (ROW width [feet] or acres/facility)	Estimated Existing Surface Disturbance (acres)
Roads			
Access Roads[1]	391 mile	45 feet	2,130
Well Pads			
Single Existing Well Pads	1,562 each	2.5 acre	3,905
Construction/Production Facilities			
Mancamps	2 each	5 acre	10
Compressor Stations	23 each	16 acre	368
Chapita Process/Compression Plant	1 each	70 acre	70
Evaporation/Recycle Facilities	3 each	20 acre	60
Water Injection Facilities	5 each	3 acre	15
Facilities Subtotal			***523***

Table 2.2-1 Existing Facilities

Facility	Multiplier (number or miles)	Size (ROW width [feet] or acres/facility)	Estimated Existing Surface Disturbance (acres)
Linear Facilities			
Gas Gathering Pipelines (cross-country)	20 mile	20 feet	47
Gas Transport Pipelines (buried)	65 mile	75 feet	591
Water Pipelines (buried)	20 mile	75 feet	182
Electric Power Lines	32 mile	100 feet	388
Linear Facilities Subtotal			***1,208***
Total Existing Disturbance			***7,766***
Total Existing Disturbance as Percent of GNBPA			***4.8%***
Existing Surface Disturbance Interim Reclamation Estimates[2]			
Reclaimable Existing Surface Disturbance (acre)			3,267
Reclaimable Percent of Existing Surface Disturbance			42%
Reclaimable Existing Surface Disturbance as % of GNBPA			2.0%

[1] Assume access road length of 0.25 mile/well pad for existing wells.
[2] Interim reclamation estimates are based on the potential to reclaim (i.e., "reclaimable") 0.5 acre per existing well pad, 27 feet ROW for roads, and all Linear Facilities summarized in the table above.

2.3 Management Common to All Alternatives

Key documents and associated procedures that control oil and gas development and production on public, Tribal, state, and private lands are presented in **Table 2.3-1**. Following the completion of the NEPA compliance process, but prior to activities occurring on public or Tribal Lands, approvals for wells and ancillary facilities must be granted by the BLM and BIA as part of the requirements set forth by the Onshore Oil and Gas Order No. 1, “Approval of Operations on Onshore Federal and Indian Oil and Gas Leases,” issued under 43 CFR 3160. This process includes two procedural options for obtaining approval to drill a well. When operators decide to drill a well on BLM-administered lands, either a Notice of Staking (NOS) or an APD must be submitted to the BLM. A separate APD is submitted to UDOGM. No surface activity can be initiated on BLM-administered land until the well drilling application is approved by the BLM. Roads, pipelines, and other surface facilities constructed on BLM-administered lands, but outside of the lease or unit would require grant of a federal ROW from the BLM. Well facilities would require a federal bond. Tribal surface and mineral estate is administered in trust by the BIA. While the BLM would approve drilling permits on Tribal Lands, surface disturbance and ROWs would be approved by the BIA. All lands belonging to the State of Utah within the GNBPA are administered by the USITLA. Approval of APDs on state and privately owned lands would be subject to requirements of the UDOGM.

Table 2.3-1 Key Oil and Gas Development and Production Guidelines Applicable to all Alternatives

Activity	Governed by	Guidance Documents	Requirements
Approvals for Well Drilling, Completion, and Production	Federal	BLM Onshore Order #1 (43 CFR 3164.1; 48 Federal Register 48916 and 48 Federal Register 56226); 43 CFR 3162.5-1 Environmental Obligations. BIA Approval of Operations (25 CFR 225.32).	• Preparation of an APD, including a surface use plan of operations and a drilling and completion plan. • Inspections prior to construction and drilling approval.
	State	UDOGM: Rule R649-3-4. Permitting of Wells to be Drilled, Deepened, or Plugged-Back; R649-3-18. On-site Predrill Evaluation.	

Table 2.3-1 Key Oil and Gas Development and Production Guidelines Applicable to all Alternatives

Activity	Governed by	Guidance Documents	Requirements
Access Road, Well Pad, and Utility Design and Construction	Federal	BLM "Surface Operating Standards for Oil and Gas Exploration and Development" (USDOI and U.S. Department of Agriculture [USDA] 2007); ROW acquisition (43 CFR 2800 *et al.)*. USEPA CAA Fugitive Dust Emission Standards (40 CFR 50), CWA Storm Water Discharges (40 CFR 122.26). USACE CWA Permitting of Dredge and Fill Operations (33 CFR 323). UDEQ Rule 307-205-7: Mining Activities Fugitive Dust Emissions Standards.	• Minimum standards for roads, well pads, and utilities. • Surface management BMPs. • Storm water discharge. • Dredge and fill operations. • Acquisition of federal ROWs. • Fugitive dust control requirements. • Requirements for encroachment onto State and County ROWs.
	State	UDOT Rule R933-3: Relocation or Modification of Existing Authorized Access Openings or Granting New Access Openings on Limited Access Highways.	
	County	Uintah County General Plan, Chapter 7e: Roads and Transportation Planning (Uintah County 2005).	
Drilling Operations	Federal	BLM Onshore Order #2 (43 CFR 3164.1; 53 Federal Register 46790)	• Well control methods. • Drilling reporting. • Well casing. • Groundwater protection methods. • Pollution control methods. • Fire prevention. • Noxious weed control.
	State	UDOGM: Rules R649-3-6 (Drilling Operations); R649-3-7 Well Control; R649-3-8 Casing Program; R649-3-9 Protection of Upper Productive Strata; R649-3-15 Pollution and Surface Damage Control; R649-3-14 Fire Hazards on the Surface; R614-2-4 Drilling Industry – Fuel Protection and Prevention; R68-9 Utah Noxious Weed Act.	
Site Security	Federal	BLM Onshore Order #3 (54 Federal Register 8056).	• Facility security requirements.
Measurement of Oil	Federal	BLM Onshore Order #4 (54 Federal Register 8086).	• Measurement methods for produced oil.
Measurement of Gas	Federal	BLM Onshore Order #5 (54 Federal Register 8100).	• Measurement methods for produced gas.
Disposal of Produced Water	Federal	BLM Onshore Order #7 (58 Federal Register 47354).	• Criteria for the management and disposal of produced water. • Reporting and recordkeeping requirements.
	State	UDOGM Rule R649-9 Waste Management and Disposal; UDOGM Rule R649-8 Reporting and Report Forms	
Installation of Compression Facilities	Federal	USEPA CAA (40 CFR 50 through 97)	• Minimum standards for air emissions. • Permit requirements and public notices.
	State	UDEQ Rule R210-1: Stationary Sources, R214-2: National Emissions Standards for Hazardous Air Pollutants, R401-4: Permitting New or Modified Stationary Sources.	

Table 2.3-1 Key Oil and Gas Development and Production Guidelines Applicable to all Alternatives

Activity	Governed by	Guidance Documents	Requirements
UIC (Disposal of produced water)	Federal	USEPA UIC (40 CFR 146.21 through 146.24).	• Permit information requirements and public notices. • Well construction methods. • Testing and monitoring procedures. • Operational monitoring and reporting.
	State	UDOGM Rule R649-5 UIC of Recovery Operations and Class II Injection Wells (R649-5-1 through R649-5-7, R693-2).	
Well Abandonment and Reclamation	Federal	BLM 43 CFR 3162.3-4 Well Abandonment.	• Well plugging and abandonment. • Wellsite restoration process.
	State	UDOGM Rule R649-3-24; and R6493-34 Well Site Restoration.	

The drilling application process requires an operator to schedule an on-site inspection of each proposed wellsite, which is attended by a representative of the appropriate Surface Management Agency (SMA) (BLM, BIA/Tribe, and/or UDOGM) and, for split-estate lands, may be attended by the private surface owner. The BLM would conduct a site-specific NEPA review and analysis prior to issuing an APD.

The objective of the on-site inspection is to review the proposed locations for wells and well pads, access roads, and ancillary facilities for consideration of the following: site-specific topography; topsoil/subsoil stockpiles; natural drainage and erosion control; vegetation and wildlife resources; historical and cultural resources; paleontological resources; and any other surface issues that may become apparent during inspection or are addressed in the lease stipulations.

The drilling application process also requires that an operator design individual well completions to protect fresh water aquifers. A BLM geologist and/or hydrologist performs an independent review of each APD utilizing Utah Geological Survey (UGS) and U.S. Geological Survey (USGS) geologic and hydrologic data and maps to generate a geologic report. The geologist and/or hydrologist identifies usable ground water and mineral-bearing zones that require protection, including Sole Source Aquifers (SSAs) and Drinking Water Source Protection Zones (DWSPZs). The petroleum engineer reviews the casing and cementing portions of the drilling plan to ensure adequate protection of those zones identified by the geologic report. The BLM further reviews the surface use plan to determine the adequacy of reserve pit design. COAs are attached to the APD as necessary.

Access roads and well pads located on federal public lands are designed and constructed under the guidelines contained in “Surface Operating Standards and Guidelines for Oil and Gas Exploration and Development″ (Gold Book) (USDOI and USDA 2007). Where possible, new roads, pipelines, and utility lines are located along existing linear ROWs in order to minimize additional surface disturbance. Construction of access roads, well pads, and other associated utilities is regulated under the CAA by the USEPA and UDEQ for fugitive dust emissions, and under the CWA by USEPA for storm water discharges and by the USACE for dredge and fill operations. UDOT Rule 307-205-7 and the Uintah County General Plan (Uintah County 2005), Chapter 7e requirements control encroachment on state and county ROWs.

Drilling and completion operations, including aquifer protection and pollution control methods, are outlined in the BLM Onshore Order No. 2 and the UDOGM Rules, which also include well spacing requirements. Operators are subject to various federal or state bonding requirements, depending on the SMA. Oil and gas production operations on federal lands are managed under Onshore Order No. 3, while Orders No. 4 and No. 5 address documentation of hydrocarbon production for taxes and royalties. The requirements for disposing of water produced during drilling and operations are addressed in Onshore Order No. 7. KMG has incorporated elements of the Onshore Orders and the BLM standard procedures into its standard operating practices for drilling and surface management.

Emissions standards associated with the installation of compression facilities, including upgrades to existing facilities and construction of new facilities, is regulated under the CAA by the USEPA and permitted through UDEQ on all lands within the GNBPA except on Tribal Lands where permitting is conducted through USEPA Region VIII.

The USEPA has promulgated rules for underground water injection that are applicable for wells located in the GNBPA. These rules address the allowable water pressures in the receiving formations, and the monitoring and reporting of these pressures. Monthly injection volumes and pressures are reported to the State of Utah or the USEPA, depending on jurisdiction. Well injection rates and pressures are measured daily through the use of surface monitoring devices at each injection well. In addition, well casing integrity tests must be completed at intervals as mandated by the State of Utah and the USEPA to ensure isolation of the injection interval.

Proposals for drilling and well testing are contained in a detailed drilling program included as a required portion of federal APD packages. Both the BLM and UDOGM prescribe procedures for well plugging and abandonment at the end of the life of a well, as well as site reclamation requirements and procedures.

2.4 No Action Alternative

Under the No Action Alternative, drilling and completion of development wells and infrastructure would continue as described in approved NEPA decision documents. A summary of surface disturbance associated with implementation of the No Action Alternative is presented in **Table 2.4-1**. This includes facilities disclosed through other NEPA documents or approved by other agencies but not yet constructed as of October 2007. This date was selected as a fixed point in time to represent information that is continuously changing. While the BLM recognizes there is a gap between this point in time and the publication date of this document, the information provides a consistent basis for evaluation of the project and alternatives.

The BLM recognizes that reclamation is difficult and is likely to require a long time to achieve in the Uinta Basin. Therefore, for purposes of analysis in this EIS, the total surface disturbance for the proposed project and alternatives without consideration of reclamation was used. The surface disturbance that would be reclaimed (i.e., reclaimable disturbance) is disclosed in the surface disturbance summary tables in recognition of the fact that the BLM would require the project proponents to reclaim unused disturbance during project operation. The disturbances listed in **Table 2.4-1** are additional to the existing disturbance as well as to disturbance associated with each of the action alternatives discussed below.

Table 2.4-1 No Action Alternative Summary of New Surface Disturbance

New Facilities	Multiplier (number or miles)	Size (ROW width [feet] or acres/facility)	Surface Disturbance (acres)
Roads			
Access Roads[1]	276 miles	45 feet	1,503
Well Pads			
New Single Well Pads	1,102 each	2.5 acres	2,755
Twinned Well Pads (Additional Disturbance)	0 each	0.2 acres	0
Multi-well Pads (Additional Disturbance)	0 each	0.2 acres	0
Well Pad Subtotal	***1,102 each***		***2,755***
Construction/Production Facilities			
Mancamps	0 each	5 acres	0
Compressor Stations	6 each	20 acres	120
Water Tank Batteries	8 each	3 acres	24

Table 2.4-1 No Action Alternative Summary of New Surface Disturbance

New Facilities	Multiplier (number or miles)	Size (ROW width [feet] or acres/facility)	Surface Disturbance (acres)
Water Injection Facilities (Additional Disturbance)	0 each	0.2 acre	0
Facilities Subtotal			***144***
Linear Facilities			
Gas Gathering Pipelines – Common ROW	262 miles	0 feet	0
Gas Gathering Pipelines – Cross-country	14 miles	20 feet	33
Gas Transport Pipelines (Buried)	0 mile	75 feet	0
Water Gathering Pipelines – Common ROW (Surface)	0 mile	0 feet	0
Water Connecting Pipelines (Buried)	26 miles	75 feet	236
Electric Power Lines	2.5 miles	100 feet	30
Linear Facilities Subtotal			***300***
No Action Alternative New Disturbance (acre)			***4,702***
GNBPA New Disturbance (%)			***2.9%***
Existing Surface Disturbance (acre)			***7,766***
Total Surface Disturbance (acre)			***12,468***
Total GNBPA Disturbed (%)			***7.7%***
Surface Disturbance Interim Reclamation Estimates[2]			
Reclaimable No Action New Surface Dist (acre)			1,753
Reclaimable Existing Surface Disturbance (acre)			3,267
Total Est. Reclaimable Surface Disturbance (acre)			5,020
Reclaimable Surface Disturbance (%)			40%
Reclaimable Surface Disturbance as % of GNBPA			3.1%

[1] Assume access road length of 0.25 mile/well pad.

[2] Interim reclamation estimates are based on the potential to reclaim 0.5 acre per new well pad, 27 feet ROW for new access roads, and all new Linear Facilities summarized in the table above.

2.4.1 Field Development Plan and Schedule

Planned natural gas development in the GNBPA includes those facilities described in the NEPA documents for the following previously approved development projects:

- Bonanza EA;
- Love Unit EA;
- North Chapita EA;
- River Bend Unit Infill EA;
- Rock House EA;
- West Bonanza EA;
- Chapita Wells-Stagecoach EIS; and
- Greater Deadman Bench EIS.

Based on the foregoing documents and a review of information from UDOGM, the BLM has estimated 1,102 wells remain to be drilled in addition to the 1,562 existing wells producing or shut in awaiting pipeline

connection in the GNBPA (as of October 2007). **Figure 2.4-1** illustrates the distribution of the existing wells and conceptual locations of analyzed yet undrilled wells within the GNBPA as of October 2007. In addition to the 1,102 wells, supporting infrastructure also would be installed as disclosed in the above NEPA documents.

2.4.2 Alternative-specific Activities

Details regarding development activities specific to the No Action Alternative are described in the following subsections.

2.4.2.1 Access Roads

Access to 1,102 wellsites would require approximately 276 miles of access road. Based upon analysis of the existing road network in the area as of June 2006 (**Figure 2.4-2**), an average new access road length of 0.25 mile per well pad has been estimated.

2.4.2.2 Drilling and Completion of Vertical Wells

Implementation of the No Action Alternative would result in the drilling, completion, and construction of associated production facilities for an estimated 1,102 wells analyzed under previous NEPA actions. All of the wells are assumed to be vertical wells drilled on individual well pads. At an estimated drilling rate of approximately 192 wells per year (current KMG rate), drilling activity in the GNBPA would continue for 5 to 6 years.

Approximately 2,270 acre-feet of water would be required to drill and complete the approved wells at an estimated 2.06 acre-feet per well, based on current water usage in the GNBPA.

2.4.2.3 Gas Production and Distribution

Approximately 276 miles of gas gathering pipeline would be installed on the surface to transport natural gas from wells to larger buried pipelines that connect to processing facilities. Approximately 262 miles (95 percent) of the natural gas gathering pipeline system would be placed in available access road ROWs. Any activity within or adjacent to a county road ROW would be done with the permission of and in coordination with the county. An additional 14 miles (5 percent) of the natural gas gathering system is expected to require cross-country routing outside of access road ROWs; cross-country routing would require a 20-foot ROW for construction.

Six compression and natural gas processing facilities would be constructed for a total additional 96,600 horsepower (hp) of compression. Approximately half of this additional compression would be gas fired and half would be electrically driven. Each site would require approximately 20 acres for the life of the facility.

The No Action Alternative would include the installation of an additional 2.5 miles of overhead electric power lines to provide power to compression facilities and pumps at water disposal facilities. The power lines would be 35-kilovolt (kV) distribution lines originating from an existing 32-mile power grid. The power lines would be installed within a 100-foot-wide ROW.

2.4.2.4 Water Requirements

Under the No Action Alternative, fresh water used for well drilling and completion purposes would continue to be obtained from existing commercial water supply sources in or near the GNBPA. Withdrawals would be made from suppliers that hold existing groundwater or surface water rights permits through the Utah Division of Water Rights. Assuming that water recycling satisfies half the demand, approximately 225 acre-feet per year would be needed. This primarily would be withdrawn from groundwater sources involving four potential suppliers: Target Trucking (permit 43 -1088), RN Industries (permits 49-164, 49-2166, and 49-2231), Buggsey's Water Service (permit 49-22801), and Dalbo Water Services (probably involving

8-T4-R3
8-T5-R3
4-T8-R20
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4-T10-R24
4-T11-R20
4-T11-R21
4-T11-R22
4-T11-R23
4-T11-R24
Duchesne River
Willow Creek

Utah
Area of Detail
Uintah County

Existing and Approved Wells
Named Streams and Rivers
Township/Range
Sections
EIS Project Area

N
Scale in Miles
Scale in Kilometers

Greater Natural Buttes Area Gas Development Project EIS

Figure 2.4-1

No Action Alternative

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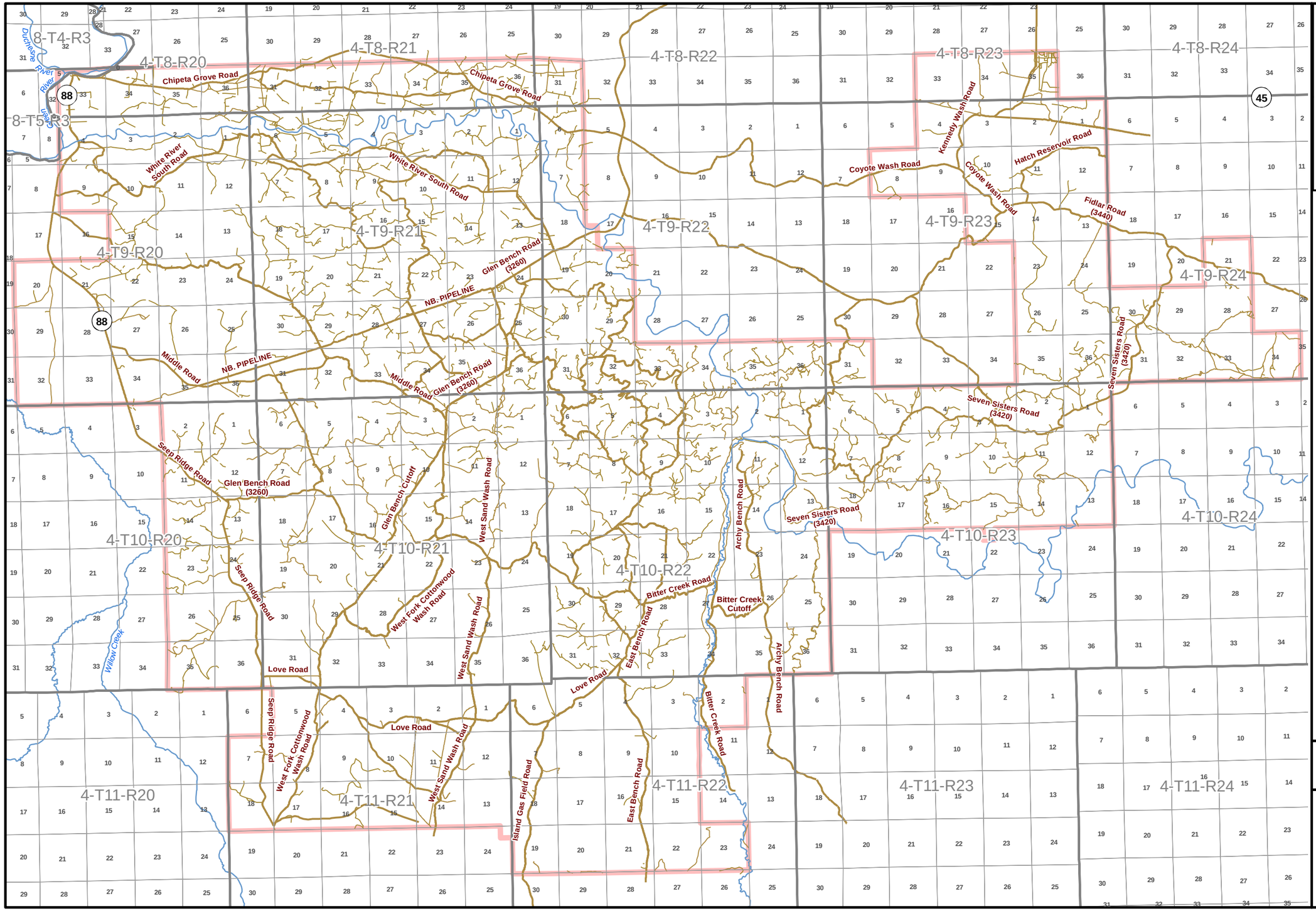

- Named Streams and Rivers
- Township/Range
- Sections
- EIS Project Area
- Trunk Roads
- Other Roads

N

Scale in Miles

Scale in Kilometers

Greater Natural Buttes Area Gas Development Project EIS

Figure 2.4-2

Existing Access Roads

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permits 49-2235, 49-2229, and/or 49-1399) (Utah Division of Water Rights 2009). Source water for Buggsey's Water Service includes both a groundwater point of diversion and a surface point of diversion on the Green River near Ouray, Utah (Utah Division of Water Rights 2009). Any remaining fresh water demands would be met by Green River withdrawals near Jensen, Utah, under an existing permit (49-225) held by the Deseret Generation and Transmission Cooperative. Any river withdrawals made through the cooperative likely would be small in total volume, and would be limited by the permitted maximum withdrawal rate of 15 cubic feet per second.

2.4.2.5 Produced Water Disposal

Eight water tank batteries at 3 acres each would be constructed for temporary storage of produced water. Approximately 26 miles of 4- to 12-inch, buried polypropylene pipe water flowlines would be installed within a 75-foot-wide ROW to transport produced water from new and existing storage facilities (tank batteries and existing evaporation ponds) to existing injection wells.

Existing evaporation/recycle facilities would be used to allow produced water to evaporate or to be re-used in completion and drilling operations. Re-use of produced water during operations reduces the amount of water that would be obtained from other sources such as the White River or water wells. Re-use of produced water also would reduce the amount of residual waste water that would require re-injection or evaporation for disposal. Some of the produced water recycled from the ponds potentially would be used for hydraulic fracturing during completion operations, reducing the amount of water that would be injected or evaporated. Use of the existing evaporation ponds would reduce water trucking requirements within the GNBPA.

Transport of produced water to disposal facilities would require approximately 32,218 truck trips annually over an estimated average round trip transport distance of approximately 10 miles. This estimate assumes an average 100-barrel (bbl) capacity water truck and estimated annual produced water from the No Action Alternative wells of 415 acre-feet. Based on these assumptions, the average daily produced water would be approximately 8,700 bbl of water per day (BWPD). Existing disposal capacity includes 7,500 BWPD in evaporation ponds and 18,200 BWPD in active disposal wells, for a total capacity of 25,700 BWPD.

2.5 Field Development Activities Common to All Action Alternatives

Project development within the GNBPA would result in the construction of new roads and use of existing roads. Equipment required by most wells would include a gas gathering pipeline, a separator, gas meter, produced water tanks, and liquid hydrocarbon storage tanks. Gas would be transported via pipeline to centralized compression and treatment facilities. Produced water would be transported by truck and/or pipeline to KMG-operated produced water disposal wells or to existing KMG or commercially owned evaporation ponds or disposal wells. To minimize new disturbance, KMG would utilize the existing ancillary facility infrastructure within the GNBPA, where possible, including gas compression facilities, power lines, water disposal and treatment facilities, and gas gathering pipelines.

The following sections summarize general pre-construction, construction, drilling and completion operations, production and maintenance operations, and abandonment and reclamation procedures common to all action alternatives. KMG has committed to AECPMs that would apply to project development unless the measures are superseded or modified by site-specific COAs. In general, KMG would:

- Comply with all applicable federal, state, county, and BLM regulations (including any applicable interagency memorandums of understanding) for all operations associated with the project;
- Adhere to all lease stipulations and COAs; and
- Conduct its operations in accordance with the standards contained in its Surface Use Plan of Operations.

Key ACEPMs are provided in **Appendix A**. Detailed numbers and summaries of anticipated surface disturbance associated with each action alternative are presented within each action alternative section.

2.5.1 Pre-construction Activities

2.5.1.1 Surveying and Notice of Staking or Application for Permit to Drill

Prior to the start of construction activities on BLM-managed lands, KMG would:

- Submit site-specific applications (NOS/APD/Sundry Notice/ROW application);
- Survey and stake the location;
- Participate in an on-site inspection;
- Submit detailed construction plans, as needed; and
- Perform cultural resource, paleontological, biological (including threatened and endangered plant and animal species), and/or other surveys, as necessary.

For wells on BLM-managed land, KMG must obtain a permit from the BLM before surface disturbing activities can take place. To initiate the permitting process, KMG would file either a NOS or an APD with the BLM Vernal Field Office, which would process the application to ensure that it meets applicable requirements. For wells on split estate lands, KMG would follow the requirements of Section VI, Onshore Oil and Gas Order No. 1, for notifying and obtaining an access agreement with the surface owner.

A complete APD normally consists of a Surface Use Plan, Drilling Plan, evidence of bond coverage, and other information that may be required by the BLM in compliance with Onshore Oil and Gas Order No. 1. A Surface Use Plan contains information describing construction operations, access, water supply, well site layout, production facilities, waste disposal, and restoration/revegetation or reclamation associated with the site-specific well development proposal. The Drilling Plan typically includes information describing the technical drilling aspects of the specific proposal, safety specifications, and subsurface resource protection. Determination of the suitability of KMG's design, construction techniques, and procedures would be made by the SMA during the permitting process.

2.5.1.2 Pre-construction Activities and Construction Initiation

Prior to construction and APD approval, the SMA would conduct on-site inspections to assess potential impacts and recommend additional methods to mitigate impacts, if warranted and viable. The SMA may impose the mitigation measures as COAs to the APD. These additional environmental protection measures could address all aspects of oil and gas development, including construction, drilling, production, reclamation, and abandonment. The SMA would notify KMG of a date, time, and place to meet to perform an on-site inspection. Survey stakes would be used to indicate the orientation of the well pad and flagging would be used to indicate the routing of access roads, pipelines, or other linear features.

Changes or modifications would be made during the inspection if needed to avoid or mitigate impacts to natural and cultural resources. Cut and fill and construction issues also would be addressed, as necessary. For wells on BLM-managed land, provisions of 43 CFR 3101.1-2 and the BLM standard lease (Form 3100-11) allow for the relocation of the proposed well up to 200 meters and a delay in operations of up to 60 days. Requirements for local notices to leasees may include other protective measures.

2.5.2 Access Roads

Primary access to the GNBPA would be via Glen Bench Road, State Highway 45, and State Highway 88. Access within the GNBPA would be via the existing road network, which consists of arterial roads and individual well access roads. County roads within the GNBPA include Class 1-B gravel roads (Seven Sisters

Road, Fidlar Road, Bitter Creek Road, and Seep Ridge Road) and a Class 1-B paved and graveled road (Glen Bench Road) (**Figure 2.4-2**).

New roads would be constructed where needed for vehicle access. Road design and construction specifications on BLM-managed lands would conform to Gold Book standards. Site-specific requirements would be incorporated on a case-by-case basis through COAs attached to the APD or ROW grant.

KMG has developed a conceptual Transportation Plan to support oil and gas development to be implemented by the Proposed Action (**Appendix C**). The exact location of well access roads would be determined at the time of the on-site inspection with the appropriate SMA. New roads would cross federal, state, Tribal, and private surfaces. The plan includes measures to minimize resource conflicts and development costs. The plan objectives would:

- Maximize use of the existing road system;
- Facilitate identification of roads not needed for operations;
- Identify main arteries and if they are designed to a standard that would accommodate all weather and the volume of traffic anticipated;
- Minimize the number of loop roads;
- Minimize the crossing of side slopes greater than 40 percent;
- Minimize profile grades;
- Minimize drainage crossings, with emphasis placed on drainages with potentially large runoff flows and floodplains; and
- Design all roads to an appropriate level, no higher than necessary.

New roads would be built and maintained to provide year-round access, as necessary. Bulldozers, graders, and other types of heavy equipment would be used to construct and maintain the road system.

Existing roads that require upgrading would meet standards appropriate to the anticipated traffic flow and all weather road requirements. Upgrading may include ditching, drainage, graveling, crowning, and capping the roadbed as necessary to provide a well constructed, safe roadway. Construction or upgrading would not occur during muddy conditions. Where operations would involve the use of county roads or where a project road would connect to a county road, KMG would coordinate activities with the county road department.

Running surfaces of new roads are typically 18 feet wide. Access road disturbance has been calculated using a maximum disturbed width of 45 feet, which corresponds to a typical road ROW. The amount of surface disturbance resulting from road construction would depend upon the number of new well pads.

2.5.3 Drilling and Completion of Vertical Wells

2.5.3.1 Well Pad Construction

Well pads would be constructed to create a level surface for drilling equipment utilizing the native materials present at the site. Mineral materials from outside the GNBPA would not be required. Locations would be leveled by balancing cut and fill areas. Construction practices may include excavation or blasting to achieve a level pad. Blasting is normally required when bedrock is near the surface. Prior to blasting, the appropriate agency would be notified, and operations would be conducted according to applicable safety standards. Topsoil and native vegetation would be removed and separately stockpiled for use in the reclamation process.

The initial average well pad size for a single well would be approximately 2.5 acres, based on average dimensions of 310 by 350 feet. If productive, the reserve pit and all portions of the well pad not needed for

routine operations would be reclaimed to reduce surface disturbance to an average of 2 acres for the life of a well. KMG would attempt interim reclamation of linear features, well pads, etc., but, due to the difficulty in achieving timely successful interim reclamation, this EIS assumes initial disturbance would be long-term disturbance. Locations for twin wells (i.e., a second vertical well drilled from the same pad to a deeper horizon) would increase disturbance by 0.5 acre for the additional well on a single pad. If the well were not productive, surface reclamation would commence upon notice of intent to abandon the last well on the pad.

2.5.3.2 Well Drilling

Drilling operations would be conducted in compliance with all applicable local rules and regulations including Federal Oil and Gas Onshore Orders and UDOGM rules and regulations. KMG anticipates that multiple drilling rigs would be operating in the GNBPA to achieve its production objectives. Each rig is expected to be able to drill an average of approximately 24 wells each year.

Following construction of the access road and well pad, a drilling rig would be transported to the wellsite and erected on the well pad. Wells would be drilled utilizing a conventional mobile drilling rig. The rig would be erected at the drill site after the conductor pipe has been set. Drilling operations typically would consist of drilling surface hole, "running" (inserting into the hole) and cementing in place the surface casing below all usable aquifers in the area, drilling a deeper and smaller diameter production hole, and running and cementing production casing. Intermediate casing, which would be used after setting surface casing and prior to drilling the production hole, also would be run when necessary. The rig would then be dismantled and demobilized from the location.

The quantity and composition of drilling fluids would be determined on a well-by-well basis. Drilling fluids typically consist of water or fresh water-based mud. Wells would utilize an open-loop circulation system with a reserve pit. Drilling fluids and cuttings would be contained entirely within the reserve pit. No hazardous substances would be placed in the reserve pit. Reserve pits would be constructed in accordance with applicable regulations and Gold Book specifications. The reserve pit would be constructed on the location and would not be located within natural drainages, where a flood hazard exists, or where surface runoff would destroy or damage the pit walls. If hydrocarbons enter a reserve pit, they would be removed as soon as possible in accordance with 43 CFR 3162.7-1. After drilling and completion operations are finished, the liquid contents of a reserve pit would be recycled for use in completing a subsequent well or removed and disposed of at an approved waste facility. Drill cuttings would be buried in the reserve pit. The reserve pit would be fenced on three sides during drilling operations and on the fourth side when the rig moves off the location. Fences would be constructed according to SMA requirements or as described in the Gold Book.

During drilling operations, a blow out preventer would be installed on the surface casing to provide protection against uncontrolled entry of reservoir fluids into the wellbore should reservoir pressures exceed the hydrostatic pressure of the wellbore fluid. In addition, a flow control manifold consisting of manual and hydraulically operated valves would be installed at ground level. All pressure control devices would comply with the provisions of Onshore Order No. 2.

Prior to setting casing, open hole well logs may be run to evaluate a well’s production potential. If the evaluation concludes that sufficient oil and/or gas is present and recoverable, then steel production casing would be run and cemented in place in accordance with the well design, as specified in the approved APD and COAs. The casing and cementing program would be designed to isolate and protect shallower formations encountered in the wellbore and to prohibit pressure communication or fluid migration between zones. The cement would protect the well by preventing formation pressure from damaging the casing and retarding corrosion by minimizing contact between the casing and formation fluids. Certain cased-hole evaluation logs also may be run subsequent to setting and cementing production casing.

2.5.3.3 Well Completion

After a well is drilled and production casing is set, a completion unit would move on location to perforate and stimulate the reservoir. The casing would be perforated across the productive zones, followed by a stimulation treatment of the formation to enhance its transmissibility of oil and gas.

Hydraulic fracture stimulation is required on the majority of wells in the GNBPA in order to enhance productivity and is the typical stimulation measure used. A water/sand slurry would be used with gels and other non-toxic chemical additives to ensure the quality of the fracture fluid. Fluid would be pumped down the well through perforations in the casing and into the formation. Pumping pressures would be increased to the point at which fractures radiate outward from the perforations into the target formation and the slurry flows rapidly into the fractures. The sand serves as a proppant to keep the created fracture open, thereby allowing reservoir fluids to move more readily into the well. Hydraulic fracturing is a well understood and commonly employed technology used on potentially productive reservoirs at depths below usable aquifers.

2.5.3.4 Water Requirements

Water would be used during drilling and completion operations and for dust abatement on access roads, as needed. Produced water, oil, and other byproducts would not be applied to roads or well pads for control of dust or weeds.

An average of approximately 16,000 bbls (2.06 acre-feet) of water would be utilized during drilling and completion operations for each well. KMG has begun to recycle produced water in the field to be used for new well completions. If this operating practice proves successful, the fresh water requirements for well completions would be reduced. KMG anticipates using recycled produced water in its new completions.

Fresh water used for drilling and completion purposes would be obtained from commercial water supply sources. These sources would consist of both groundwater from wells and surface withdrawals from the Green River. Withdrawals would be made from suppliers that hold existing water rights permits through the Utah Division of Water Rights.

Groundwater would be obtained from Target Trucking (permit 43-1088), RN Industries (“RNI Water Plant”; permits 49-1645, 49-2166, and 49-2231), Buggsey’s Water Service (permit 49-22801), and Dalbo Water Services (probably permits 49-2235, 49-2229 and/or 49-1399). Source water for Buggsey’s Water Service includes both an underground point of diversion (a well) and a surface point of diversion (the Green River near Ouray, Utah) (Utah Division of Water Rights 2009). Based on estimates from KMG and additional estimates of the supply available from Dalbo Water Services wells, approximately 225 acre-feet per year would be obtained from these four sources combined. All of these points of diversion are located in Ouray, Utah, or the general vicinity.

As needed, all remaining fresh water would be obtained through the Deseret Generation and Transmission Cooperative. That organization holds rights to surface withdrawals from the Green River approximately 3 miles south of Jensen, Utah (permit 49-225) (Utah Division of Water Rights 2009).

2.5.3.5 Ancillary Facilities

Mancamps to house rig crews near the working rigs likely would be required in addition to those existing in the GNBPA. Each mancamp would accommodate a single rig crew. KMG would locate one mancamp on federal land (Section 3, T10S, R21E) and a second mancamp on state land. Each mancamp would require approximately 5 acres and would be reclaimed when no longer needed.

2.5.3.6 Equipment and Manpower Requirements

Four to six men would comprise the construction crew for each access road and well pad. They would access the location using an average of three light trucks. Two to three pieces of heavy equipment, such as

bulldozers and motor graders, would be used to perform the earth-moving operations. Both the access road and well pad typically can be constructed within 7 to 14 days.

An average of 10 persons would be required for drilling and completion operations, although the actual number would range from approximately 5 to 50 people. An average of eight vehicles would be used for access to each location daily.

Duration of drilling operations on a given well can vary depending on depth and conditions encountered while drilling, but duration on location in the GNBPA can range from approximately 8 to 50 days. Completion operations typically require approximately 7 days per formation completed.

2.5.4 Gas Production, Distribution, and Maintenance

2.5.4.1 Wellsite Facilities

Well production facilities would include the well head, valves, piping, and a combination separator/gas meter that would be housed in a small building on each location. Each well pad in the Natural Buttes or Love units within the GNBPA would contain a single 300-bbl combination tank to contain produced water and condensate. Outside of the federal units but within the GNBPA, each location would contain two 300-bbl tanks, one each for produced water and liquid hydrocarbons. In addition, one or more 500-gallon (or smaller) chemical tanks containing scale/corrosion inhibitor, methanol, or soap and a plunger lift would be located on all wellsites.

2.5.4.2 Gas Pipelines

Steel gathering pipelines with a 3, 4, 6, 8, or 10-inch outside diameter would be installed on the ground surface to transport the produced gas from the wells to the larger (more than 10 inches) lateral pipelines. Burying pipelines throughout much of the GNBPA can be challenging due to the presence of shallow bedrock and difficult reclamation conditions related to shallow, saline soils. However, KMG continuously evaluates the practicality of burying natural gas pipelines on a case-by-case basis and has found that it generally is practical to bury lateral lines when collecting gas from four wells or more on a multi-well pad. For purposes of this EIS analysis, it is assumed that KMG would not bury natural gas gathering pipelines that are 10 inches or less in diameter. KMG would utilize existing ROWs and road disturbances as much as possible when burying new pipelines.

The applicant has committed to burying new pipelines within 100-year floodplains (**Appendix A**). In addition, pipeline crossings of streams would conform to the *Hydraulic Considerations for Pipelines Crossing Stream Channels* as outlined in the BLM Vernal RMP (BLM 2008b). Pipeline segments would be welded or zaplocked together on disturbed areas in or near the location, whenever possible, and dragged into place. New gathering pipelines would be installed parallel to and within approximately 10 feet of access road running surfaces unless precluded by topography, by county prohibition where installed adjacent to county-maintained roads, or by gathering system constraints. Surface gathering lines would be buried where they intersect with access roads. The exact location of pipelines would be determined at the time of the on-site inspection with the appropriate SMA. Ramps across the surface lines would be used where necessary to allow the periodic crossing of surface gathering lines.

The 27-foot portion of access road ROWs outside the 18-foot road running surface would be used for routing surface natural gas gathering pipelines. The surface area within a road ROW but outside of a road's running surface would be re-vegetated after gathering line construction is complete, although reclamation is recognized to be difficult in the arid environment of the GNBPA. In addition, some cross-country routing of surface gathering pipeline may be required that would result in disturbance to a 20-foot-wide pipeline ROW. All areas within those cross-country ROWs would be re-vegetated after gathering line construction.

Drilling the proposed wells may require the installation of larger buried pipelines to transport natural gas to processing facilities. Construction of larger-diameter (larger than 10 inches) natural gas pipelines would

require temporary use of a 75-foot-wide construction corridor. The larger buried pipelines would be located within existing pipeline ROWs or routed adjacent to roads as much as possible. Where practical, the 75-foot width would include the actual road surface. Pipe segments would be welded into longer sections adjacent to a trench and buried. Construction and installation of a buried pipeline would result in additional surface disturbance. After the pipe is buried, the construction corridor and ROW would be reclaimed.

2.5.4.3 Gas Compression and Processing

Natural gas would be transported to existing facilities for compression, treatment, processing, and sales gas compression. New gas-powered compressors would be muffled and housed to decrease the audible noise level. Gas would be transported from the wellhead via gathering pipelines to field compressor stations, where the gas would be compressed, to the Chapita central processing plant in Section 15, T9S, R22E, then further compressed for delivery to interstate pipelines operated by Questar, Northwest Pipeline, Wyoming Interstate Company, Colorado Interstate Gas, or others.

KMG would install only low emission dehydrators at existing and future compressor stations to eliminate hazardous air pollutants (HAPs) that may otherwise result. Additional dehydration is performed at the existing processing facilities, including the Chapita Plant, Bridge Station, Ouray, and Cottonwood. KMG also would install control devices and implement procedures to reduce emission of air pollutants during drilling, completion, production, and transportation activities.

2.5.4.4 Electrical Power Requirements

Additional overhead electric power lines may be installed to serve produced water disposal wells and proposed compression. Either natural gas-driven generators or natural gas engines would be used initially to supply power to the injection pumps at the proposed produced water disposal wells. Overhead electric lines may be subsequently installed where practical to provide power to the pumps, replacing the natural gas powered compressor engines. KMG anticipates an approximately 50/50 split between electric powered and natural gas powered compressor engines.

2.5.4.5 Normal Maintenance

New wells would typically be visited daily for 2 to 3 weeks after completion, depending upon well performance. During this time, the new well would be visited once by a "pumper" (oilfield maintenance worker) and by 3 to 4 water trucks daily. Visits to each well would be reduced to approximately three times a week by one pumper and one water truck daily for the life of a well. After initial completion, wellsite telemetry would be installed to reduce the number of trips to a well by a pumper; however, this reduction was not quantified for the analysis in this EIS. Surface pipelines would be visually inspected on a regular basis.

Maintenance of non-county roads within the GNBPA during drilling and construction would be the responsibility of KMG and other operators, as appropriate, and would be performed consistent with SMA specifications. During the duration of the project, KMG/operators would monitor the project roads and perform appropriate repairs. Repairs may be necessary to correct excessive soil movement, rutting, and/or damage to cattleguards, gates, or fences.

2.5.4.6 Workovers

Periodically, a workover on a well may be required. A workover uses a unit similar to a completion rig to perform a variety of maintenance procedures and keep the well operating as efficiently as possible. Workovers can include repairs to the wellbore equipment (casing, tubing, etc.), the well head, or the producing formation itself. These repairs generally occur during daylight hours and are typically of short duration. The typical workover would require approximately 3 days; however, workover operations can range from 1 to 10 days, with a small number requiring more than 10 days. Workover operations may require 4 to 30 men, with average manpower requirements of 6 persons. The frequency for this type of work cannot be accurately projected since workovers vary well by well and depend on site-specific

circumstances. No additional surface disturbance would result from workover operations, and require no additional regulatory approvals.

2.5.5 Produced Water Disposal

Produced water may be confined to a lined pit for a period not to exceed 90 days after initial production, weather permitting. After the 90-day period, the produced water would be contained on the well pad in a tank prior to being transported by water hauling trucks or gathering pipelines to disposal facilities. Produced water would be disposed of via subsurface injection, into commercial produced water disposal ponds, into existing KMG-owned evaporation ponds, or would be used in subsequent completion and additional drilling operations. Water not evaporated in a particular pond or used for fracturing would be pumped via pipeline to either a disposal well for injection or to one of the other ponds.

2.5.5.1 Water Disposal Wells and Injection Facilities

Additional produced water disposal wells would likely be drilled in the GNBPA on existing well pads, or existing wellbores would be converted from natural gas production to disposal operations to minimize additional surface disturbance. The number of produced water disposal wells would depend upon the ability to obtain the necessary permits through the appropriate permitting authority and the number of additional wells drilled under a given alternative. Injection into disposal wells is KMG's preferred method of produced water disposal. The Birds Nest aquifer, a unit in the Parachute Creek Member of the Green River Formation, would be the primary subsurface zone for injection of produced water.

Injection disposal of produced water is a highly regulated activity. Underground injection wells used in conjunction with oil and gas production are referred to as Class II wells under the UIC program (**Table 2.3-1**). Class II wells can be used either for pressure maintenance to increase the efficiency of the recovery of oil and gas, or can be used for the disposal of liquid waste generated by oil and gas production operations that meets the definition of exploration and production waste exempt under the Resource Conservation and Recovery Act, Subpart D (mainly produced water).

Permitting of Class II wells is regulated in Utah by the USEPA and the State of Utah. On statutorily defined "Indian Country" lands (18 USC 1151), the USEPA is the authorizing regulatory agency and the UDOGM regulates the UIC program on lands not designated as "Indian Country." In the GNBPA, the USEPA regulates the UIC program. The permit process requires agency review of the application and a 30-day public comment period upon publication of notice of a draft permit. If there are no protests or objections to a pending application, it will be approved administratively.

Once produced water injection commences, the operator must conduct tests or surveys and provide the agency with the results as required under the UIC program. The tests and data required include a step-rate test, a mechanical integrity test, a radioactive tracer survey, a temperature test on the injection well, and temperature surveys on nearby wells to document that injection wells meet construction requirements, which prevent migration of fluids into underground sources of drinking water. The regulating agency may require additional monitoring if necessary. As required under the UIC program, a monitoring plan will be included in all Birds Nest aquifer UIC permits approved by the USEPA in the GNBPA. The monitoring plan for existing injection operations will include the installation of five wells to monitor for potential changes in the aquifer water chemistry and hydrodynamics.

2.5.5.2 Water Pipeline System

KMG would install 4- to 12-inch buried polypropylene pipelines to interconnect all water management facilities including salt water disposal wells, evaporation/recycle ponds, and centralized tank batteries. These water pipelines would be buried to prevent freezing. These pipelines would facilitate water transport among the individual disposal sites during maintenance on either a disposal well or evaporation/recycle pond, providing a countermeasure and response mechanism if problems occur elsewhere in the water management system. The buried water pipelines would be located adjacent to existing roads or within

existing buried pipeline corridors, where possible. Construction would require a 75-foot construction ROW, which would be reclaimed as near as practical after pipeline installation as described in Section 2.5.7, Reclamation and Abandonment.

Water gathering pipelines (between wells and disposal systems) would be considered to reduce traffic impacts from water trucking to disposal facilities. Three- to 6-inch steel and/or polypropylene pipeline could be installed in conjunction with (along side) the gas gathering pipelines. Surface installation within the 45-foot construction width of the access road would result in no additional surface disturbance. KMG continuously evaluates the technical and economic viability of water gathering pipelines versus trucking. In general, KMG currently transports produced water by truck from areas that are remote from the centralized water collection system. On a case-by-case basis, KMG evaluates the economic feasibility of connecting remote areas to the centralized water collection system with pipelines and has connected several of these remote areas to the system. However, analysis for the EIS has assumed that all water transport between wells and disposal systems would be by truck.

2.5.6 Hazardous Materials and Solid Waste

A variety of chemicals, including lubricants, paints, and additives are used to drill, complete, and operate a well. Some of these substances may contain constituents that are hazardous. Hazardous materials can include some greases or lubricants, solvents, acids, paint, and herbicides, among others. These materials would not be stored at well locations although they may be kept in limited quantities on drilling sites and at production facilities for short periods of time. Transportation of the materials to the well location is regulated by the USDOT under 49 CFR, Parts 171–180. USDOT regulations pertain to the packing, container handling, labeling, vehicle placarding, and other safety aspects.

None of the chemicals that would be used during drilling, completion, or production operations meet the criteria for being an acutely hazardous material/substance or meet the quantities criteria per the BLM Instruction Memorandum No. 93-344. Chemicals subject to reporting under Title III of the Superfund Amendments and Reauthorization Act (SARA) in quantities of 10,000 pounds or more would not be used, produced, stored, transported, or disposed of annually while drilling or completing a well in the GNBPA. In addition, extremely hazardous substances, as defined in 40 CFR 355, in threshold planning quantities, would not be used, produced, stored, transported, or disposed of while drilling or completing a well.

Most wastes that would be generated at project locations are excluded from regulation by the Resource Conservation and Recovery Act under the exploration and production exemption in Subtitle C (40 CFR 261.4[b][5]) and are considered to be solid wastes. These wastes include those generated at the wellhead, through the production stream, and through the gas plant. Exempt wastes include produced water, production fluids such as drilling mud or well stimulation flowback, and contaminated soils.

Any release of oil, gas, salt water, or other such fluids would be immediately cleaned up and removed to an approved disposal site. The spills would be reported to the AO and other appropriate authorities. KMG would develop and maintain site-specific Spill Prevention Control and Countermeasures Plans (SPCCPs) for each production facility in the GNBPA. An example site-specific SPCCP is provided in **Appendix D**. To satisfy SPCCP requirements, if storage facilities or tanks are constructed, they would be constructed in accordance with applicable regulations.

Trash containers and portable toilets would be located on construction sites. Garbage, trash, and other waste materials would be collected in portable, self-contained, fully enclosed trash cages during construction, drilling, and completion operations and disposed of at an approved landfill. Trash would not be burned on location. Construction locations and wellsites would be cleaned of other debris and waste materials and removed from the location after drilling and completion operations.

2.5.7 Reclamation and Abandonment

Reclamation of surface disturbance associated with the proposed project and alternatives would be implemented in accordance with the Green River District Reclamation Guidelines (BLM 2009a). The guidelines would apply to reclamation activities in the GNBPA and include measurable standards as well as the monitoring and reporting of compliance with the reclamation standards. KMG's draft Reclamation Plan (**Appendix E**) generally is consistent with the Green River District Reclamation Guidelines and would be revised and finalized to develop a site-specific plan for each component of the project for which an APD and/or ROW application is submitted to the BLM.

Surface disturbance associated with electric power line, surface pipeline, and buried pipeline installation would be reclaimed as soon as construction is complete according to the Reclamation Plan (**Appendix E**). Interim reclamation of the well pad would be performed as soon as practicable in accordance with applicable COAs after a well is drilled, completed, and put on production. Before reclamation begins on the reserve pit, it would be allowed to dry. After liquid removal, pits would be closed in accordance with surface management agency guidelines. The liner would be buried to a minimum of 4 feet below the surface. The pit and that portion of the location not needed for production operations would be reclaimed in accordance with applicable state regulations and Gold Book procedures. KMG would reseed the disturbed areas with mixtures specified by the applicable SMA or surface owner. Follow-up survey and treatment of weeds and invasive species would be conducted until reclamation is deemed to be successful and/or complete.

Abandoned wellsites, roads, and other disturbed areas would be restored as near as practical to their original condition and in compliance with applicable federal, state, and Tribal regulations as well as the COAs. At the time of final abandonment, all surface equipment, including surface gathering pipelines, would be removed from the site. Cut and fill materials would be recontoured and topsoil would be replaced on the surface above the former location to blend the site with its natural surroundings. All surface disturbance would then be planted with a seed mixture of grass and plant species as specified by the appropriate SMA. Follow-up survey and treatment of weeds and invasive plant species would be conducted until reclamation is deemed to be successful and/or complete.

At final abandonment of wells on BLM-managed lands, the casing would be cut off at the base of the cellar or 3 feet below the final restored ground level, whichever is deeper. KMG would cap the casing with a metal plate a minimum of 0.25 inch thick. The cap would be welded in place, and the well location and identity would be permanently inscribed on the cap. The cap would be constructed with a weep hole.

2.6 Proposed Action Alternative

A summary of surface disturbance associated with implementation of the Proposed Action Alternative is presented in **Table 2.6-1**. The disturbance indicated in **Table 2.6-1** is new disturbance that would occur in addition to that from the No Action Alternative discussed in Section 2.4, No Action Alternative.

Table 2.6-1 Proposed Action Alternative Summary of New Surface Disturbance

New Facilities	Multiplier (number or miles)	Size (ROW width [feet] or acres/facility)	Surface Disturbance (acres)
Roads			
Access Roads[1]	760 miles	45 feet	4,147
Well Pads			
New Single Well Pads	3,041 each	2.5 acres	7,603
Twinned Well Pads (Additional Disturbance)	634 each	0.2 acre	127

Table 2.6-1 Proposed Action Alternative Summary of New Surface Disturbance

New Facilities	Multiplier (number or miles)	Size (ROW width [feet] or acres/facility)	Surface Disturbance (acres)
Multi-well Pads (Additional Disturbance)	0 each	0.2 acre	0
Well Pad Subtotal	***3,675 each***		***7,729***
Construction/Production Facilities			
Mancamps	2 each	5 acres	10
Compressor Stations	2 each	20 acres	40
Water Tank Batteries	2 each	3 acres	6
Water Injection Facilities (Additional Disturbance)	15 each	0.2 acre	3
Facilities Subtotal			***59***
Linear Facilities			
Gas Gathering Pipelines - Common ROW	722 miles	0 feet	0
Gas Gathering Pipelines - Cross-country	38 miles	20 feet	92
Gas Transport Pipelines (Buried)	35 miles	75 feet	318
Water Gathering Pipelines – Common ROW (Surface)	587 miles	0 feet	0
Water Connecting Pipelines (Buried)	25 miles	75 feet	227
Electric Power Lines	7 miles	100 feet	85
Linear Facilities Subtotal			***722***
Proposed Action New Disturbance (acre)			***12,658***
GNBPA New Disturbance (%)			***7.8%***
No Action Alternative New Disturbance (acre)			***4,702***
Existing Surface Disturbance (acre)			***7,766***
Total Surface Disturbance (acre)			***25,125***
Total GNBPA Disturbed (%)			***15.4%***
Surface Disturbance Interim Reclamation Estimates[2]			
Reclaimable New Surface Disturbance (acre)			4,731
Reclaimable No Action New Surface Dist (acre)			1,753
Reclaimable Existing Surface Disturbance (acre)			3,267
Total Est. Reclaimable Surface Disturbance (acre)			9,751
Reclaimable Surface Disturbance (%)			39%
Reclaimable Surface Disturbance as % of GNBPA			6.0%

[1] Assume access road length of 0.25 mile/well pad.

[2] Interim reclamation estimates are based on the potential to reclaim 0.5 acre per new well pad, 27 feet ROW for new access roads, and all new Linear Facilities summarized in the table above.

2.6.1 Field Development Plan and Schedule

KMG and other operators would drill a maximum of 3,675 new wellbores in addition to the existing producing wells and approved/permitted wells yet to be drilled in the GNBPA as discussed in Section 2.4, No Action Alternative. **Figure 2.6-1** illustrates available locations for new wells at a 20-acre spacing. Although actual operations are subject to change as the project proceeds, KMG and other operators would drill additional wells at an average rate of approximately 358 wells per year for over 10 years or until the resource base is fully developed. The total number of wells that would be drilled during the life of the project or during any particular year would depend largely on factors outside of KMG's control such as permit

approvals, production success, engineering technology, economic factors, commodity prices, rig availability, and lease stipulations. The productive life of each well is estimated to be approximately 30 to 50 years. KMG estimates that 3 percent of the drilled wellbores might be dry. A dry hole most commonly results from mechanical failure.

2.6.2 Alternative-specific Activities

2.6.2.1 Access Roads

The Proposed Action Alternative would result in the drilling of up to 3,041 wells on new well pads. An additional 634 wells would be deepened recompletions or twins of existing wells from existing well pads. Access to 3,041 new well pads, assuming an average road length of approximately 0.25 mile per well pad, would require construction of 760 miles of new roads.

2.6.2.2 Infill Drilling and Multiple-Well Pads

Infill Drilling

Infill drilling of vertical wells would be performed on 40-acre and 20-acre surface spacing throughout the GNBPA (i.e., with 16 to 32 surface well pads per section). KMG defines a 40-acre well pad as the first well pad located in a governmental 40-acre quarter-quarter section. A 20-acre pad is defined as the second well pad located in a 40-acre quarter-quarter section. Downhole well spacing would be based on KMG's reservoir engineering evaluation on an on-going basis and would be site-dependent, potentially ranging from 16 wells per section (40-acre spacing) to 64 wells per section (10-acre spacing) or more. A maximum of 3,041 new well pads would be constructed to achieve the combined 40-acre and 20-acre surface spacing assuming vertical wells. This EIS assumes 20-acre spacing for all 3,041 new well pads, which represents the maximum surface disturbance.

Mesaverde-only Completions

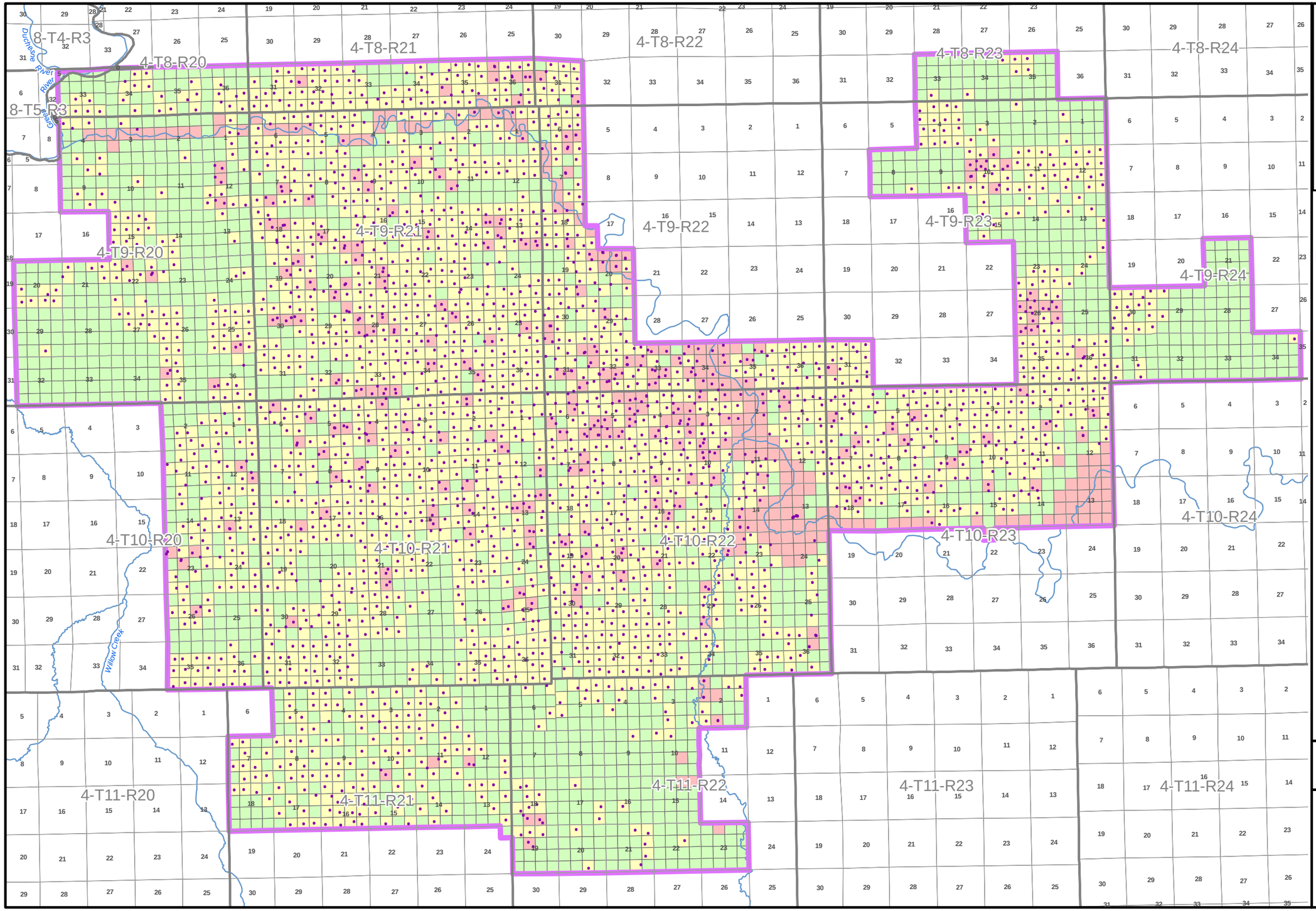
Under the Proposed Action Alternative, KMG would plan to drill 634 completions to the Mesaverde Formation by either deepening an existing Wasatch wellbore or by drilling a twin well on an existing well pad. KMG expects most of the Mesaverde-only completions would be located in T8S-R21E, T9S-R21E, T9S-R22E, T10S-R21E, T10S-R22E, and T10S-R23E.

Directional Drilling

Portions of the GNBPA pose environmental constraints to drilling a vertical well from the surface. KMG has made a preliminary determination of those areas based upon the following constraining factors:

- Topography, including steep slopes that preclude construction of a well pad for a vertically drilled well without major cuts-and-fills;
- The viewshed (line-of-sight from the centerline up to 0.5 mile on either side of the river, whichever is less) of the White River corridor, outside of the Indian Trust Lands; and
- Areas within 600 feet of the White River within the Indian Trust Lands.

In areas where the gas resources in the reservoirs warrant a downhole spacing of less than 20 acres based on reservoir engineering evaluation, or in those areas where environmental constraints preclude vertical wells, KMG would test and attempt to utilize directional drilling technology to drill from nearby 20-acre or 40-acre pads if such is technically and economically viable. It must be stressed that the decision of whether to drill an area to a downhole spacing less than 20 acres with directional wells would depend on KMG's ability to drill and develop the gas resources in an economically and technically viable manner because of the economically marginal nature of wells in the GNBPA. Analysis of the Proposed Action Alternative assumes vertical wells would be drilled at all locations.



Greater Natural Buttes Area Gas Development Project EIS

Figure 2.6-1

Proposed Action

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KMG currently anticipates that most of the wells with a downhole spacing of 20 acres or less would be located in portions of T9S-R21E, T9S-R22E, T10S-R22E, and T10S-R23E, or in areas of environmental constraints discussed above. However, KMG may drill wells with a downhole spacing of 20 acres or less at any location within the GNBPA, as production success is evaluated during the life of the project. The downhole density of wells within the GNBPA would reflect effective reservoir drainage patterns for the GNBPA. However, the surface density of the KMG well pads would not exceed 32 pads per section.

KMG is currently using directional drilling techniques in development within the Bonanza Unit. Success in the Bonanza area in the east portion of the GNBPA does not necessarily indicate that directional drilling within the GNBPA would be successful.

An average of 15 drilling rigs would be operating in the GNBPA over a 10-year period to drill the 3,675 wells proposed by KMG and other operators. Each rig would average 24 wells per year. These wells would be in addition to 1,102 wells authorized by prior NEPA as described under the No Action Alternative.

Based on the need for 2.06 acre-feet per well, an estimated 7,571 acre-feet of fresh water would be required to drill and complete 3,675 wells or approximately 757 acre-feet each year for the projected 10-year drilling period.

If a location is shared with more than one well and fluid volumes so warrant, additional tanks may be installed to provide increased storage capacity with no increase in well pad size/disturbance. KMG may install a single larger separator on pads that share more than one well. A berm capable of containing 110 percent of the capacity of the largest tank would surround all tanks. All natural gas would be measured electronically, and KMG plans to install telemetry equipment to remotely operate and monitor wells, minimizing the number of wellsite visits.

Two mancamps of approximately 5 acres each (10 total acres) would be located within the GNBPA.

2.6.2.3 Gas Pipelines

Approximately 760 miles of natural gas gathering pipeline would be installed to transport natural gas from project wells to larger buried pipelines that connect to processing facilities. Approximately 722 miles (95 percent) of the surface natural gas gathering pipeline system would be placed in available access road ROWs. Approximately 38 miles (5 percent) of the natural gas gathering system would require cross-country routing outside of access road ROWs; cross-country routing would require a 20-foot ROW for construction. Approximately 35 miles of larger-diameter, buried transport pipeline would be constructed within a 75-foot-wide construction ROW that would overlap with other ROWs when possible.

2.6.2.4 Gas Compression and Processing

Two compression sites would be constructed to meet project compression needs within the GNBPA; each site would require approximately 20 acres for the life of the facility. These facilities would provide a total additional 79,000 hp of new compression; approximately half gas fired and half electrically driven.

2.6.2.5 Electrical Power Requirements

Under the Proposed Action Alternative, approximately 7.0 miles of overhead electric lines would be installed to provide power to the pumps at water disposal wellsites. The new power lines would be 35 kV distribution lines that would originate from the existing power grid. Pole mount transformers would be installed within 500 feet of each point of use to obtain 480-volt power for the pumps. The power lines would be installed within a 100-foot ROW. Surface disturbance associated with electric power line installation within the ROW would be reclaimed as soon as construction is completed.

2.6.2.6 Water Disposal Facilities

Up to 15 new water disposal wells would be drilled in the GNBPA on existing well pads or using existing well borings, located in Sections 19 through 36, T9S, R21E. Assuming an average disposal capacity of 4,000 BWPD for each disposal well, the 15 new disposal wells would have a combined capacity of 60,000 BWPD. Although estimated future water production is difficult to predict because of variable water saturation conditions as the gas reservoir is produced and depleted, KMG has estimated that approximately 29,500 BWPD would be produced under the Proposed Action. Therefore, the proposed expansion of water disposal capacity would be more than adequate to accommodate the produced water from the project.

Disposal well locations would be chosen based on suitable subsurface rock formation properties and water quality data. Each new water disposal well would add approximately 0.2 acre of new disturbance to an existing well pad, for a total maximum new surface disturbance of 3.0 acres. Several produced water tanks would be added to the sites of two of the more centrally located disposal wells. Additional tanks would add approximately 3.0 acres to the existing well pad for a total new surface disturbance of approximately 6.0 acres.

Approximately 25 miles of 4- to 12-inch, buried polypropolene water flowlines would be installed within a 75-foot-wide ROW to interconnect all water management facilities including salt water disposal wells, existing evaporation/recycle ponds and centralized tank batteries.

Currently, produced water is transported by truck from wellsite storage tanks to disposal facilities. The average round trip distance between storage tanks and disposal facilities is estimated to be approximately 10 miles. Implementation of the Proposed Action would result in average annual additional produced water of approximately 10,744,414 bbls and would require approximately 107,444 annual disposal truck trips.

To reduce air quality impacts associated with water disposal truck traffic, approximately 587 miles of 3- to 6-inch polypropylene pipeline could be installed on the surface along side the surface natural gas gathering pipelines and within the 45-foot-wide access road ROWs. KMG would not implement construction of water pipelines on the ground surface until they identify a means of addressing the potential for freezing of water in the pipes. Installation of such surface pipelines would neither increase nor decrease the surface disturbance associated with the Proposed Action Alternative.

2.7 Resource Protection Alternative

A summary of surface disturbance associated with implementation of the Resource Protection Alternative is indicated in **Table 2.7-1**. The disturbance indicated in **Table 2.7-1** is new disturbance that would occur in addition to that from the No Action Alternative.

Table 2.7-1 Resource Protection Alternative Summary of New Surface Disturbance

New Facilities	Multiplier (number or miles)	Size (ROW width [feet] or acres/facility)	Surface Disturbance (acres)
Roads			
Access Roads[1]	594 miles	45 feet	3,238
Well Pads			
New Single Well Pads	1,484 each	2.5 acres	3,710
Twinned Well Pads (Additional Disturbance)	634 each	0.2 acre	127
Multi-well Pads (Additional Disturbance)	1,557 each	0.2 acre	311
Well Pad Subtotal	***3,675 each***		***4,148***

Table 2.7-1 Resource Protection Alternative Summary of New Surface Disturbance

New Facilities	Multiplier (number or miles)	Size (ROW width [feet] or acres/facility)	Surface Disturbance (acres)
Construction/Production Facilities			
Mancamps	2 each	5 acres	10
Compressor Stations	2 each	20 acres	40
Water Tank Batteries	2 each	3 acres	6
Water Injection Facilities (Additional Disturbance)	15 each	0.2 acre	3
Facilities Subtotal			***59***
Linear Facilities			
Gas Gathering Pipelines - Common ROW	564 miles	0 feet	0
Gas Gathering Pipelines - Cross-country	30 miles	20 feet	72
Gas Transport Pipelines (Buried)	35 miles	75 feet	318
Water Gathering Pipelines - Common ROW (Surface)	458 miles	0 feet	0
Water Connecting Pipelines (Buried)	25 miles	75 feet	227
Electric Power Lines	7 miles	100 feet	85
Linear Facilities Subtotal			***702***
Resource Protection Alternative New Disturbance(acre)			***8,147***
GNBPA New Disturbance (%)			***5.0%***
No Action Alternative New Disturbance (acre)			***4,702***
Existing Surface Disturbance (acre)			***7,766***
Total Surface Disturbance (acre)			***20,615***
Total GNBPA Disturbed (%)			***12.7%***
Surface Disturbance Interim Reclamation Estimates[2]			
Reclaimable New Surface Disturbance (acre)			3,387
Reclaimable No Action New Surface Dist (acre)			1,753
Reclaimable Existing Surface Disturbance (acre)			3,267
Total Est. Reclaimable Surface Disturbance (acre)			8,407
Reclaimable Surface Disturbance (%)			41%
Reclaimable Surface Disturbance as % of GNBPA			5.2%

[1] Assume access road length of 0.4 mile/well pad for Resource Protection Alternative.

[2] Interim reclamation estimates are based on the potential to reclaim 0.5 acre per new well pad, 27 feet ROW for new access roads, and all new Linear Facilities summarized in the table above.

2.7.1 Field Development Plan and Schedule

The Resource Protection Alternative would be similar to the Proposed Action, but places a limit on the maximum number of new well pad locations to 1 pad per 40 acres (maximum of 16 well pads per section). **Figure 2.7-1** illustrates the available locations for new wells at a 40-acre spacing. Based on proposed activities identified earlier as common to all action alternatives, KMG and other operators would drill a maximum of 3,675 new wellbores in addition to the existing producing wells and approved/permitted wells yet to be drilled in the GNBPA. In order to complete 3,675 new wellbores from a reduced number of surface well pad locations, directional drilling techniques would need to be implemented by the operators.

As discussed under the Proposed Action Alternative, KMG and other operators would drill additional wells at an average rate of approximately 358 wells per year over a period of 10 years or until the resource base is

fully developed, with a maximum total of 3,675 wellbores. The total number of wells drilled during the life of the project or during any particular year would depend largely on factors outside of KMG's control. The estimated productive life of each well would be approximately 30 to 50 years, and 3 percent of the drilled wellbores might be dry principally due to mechanical failure.

The drilling schedule, well drilling and completion parameters, equipment and manpower requirements, compressor stations, water disposal facilities, buried water and gas pipelines, electric power facilities, and ancillary facilities would be as discussed under the Proposed Action Alternative.

The number of disturbance impacts associated with production facilities (mancamps, compressor stations, water tank batteries, and water disposal wells) as well as electrical power requirements is expected to be the same for the Resource Protection Alternatives as it would be for the Proposed Action Alternative.

2.7.2 Alternative-specific Activities

2.7.2.1 Access Roads

Approximately 594 miles of new access road would be constructed to a maximum of 1,484 new well pads that would be available under this alternative. Because fewer new well pads would be constructed under the Resource Protection Alternative than under the Proposed Action Alternative, the average new access road length would be approximately 0.4 mile.

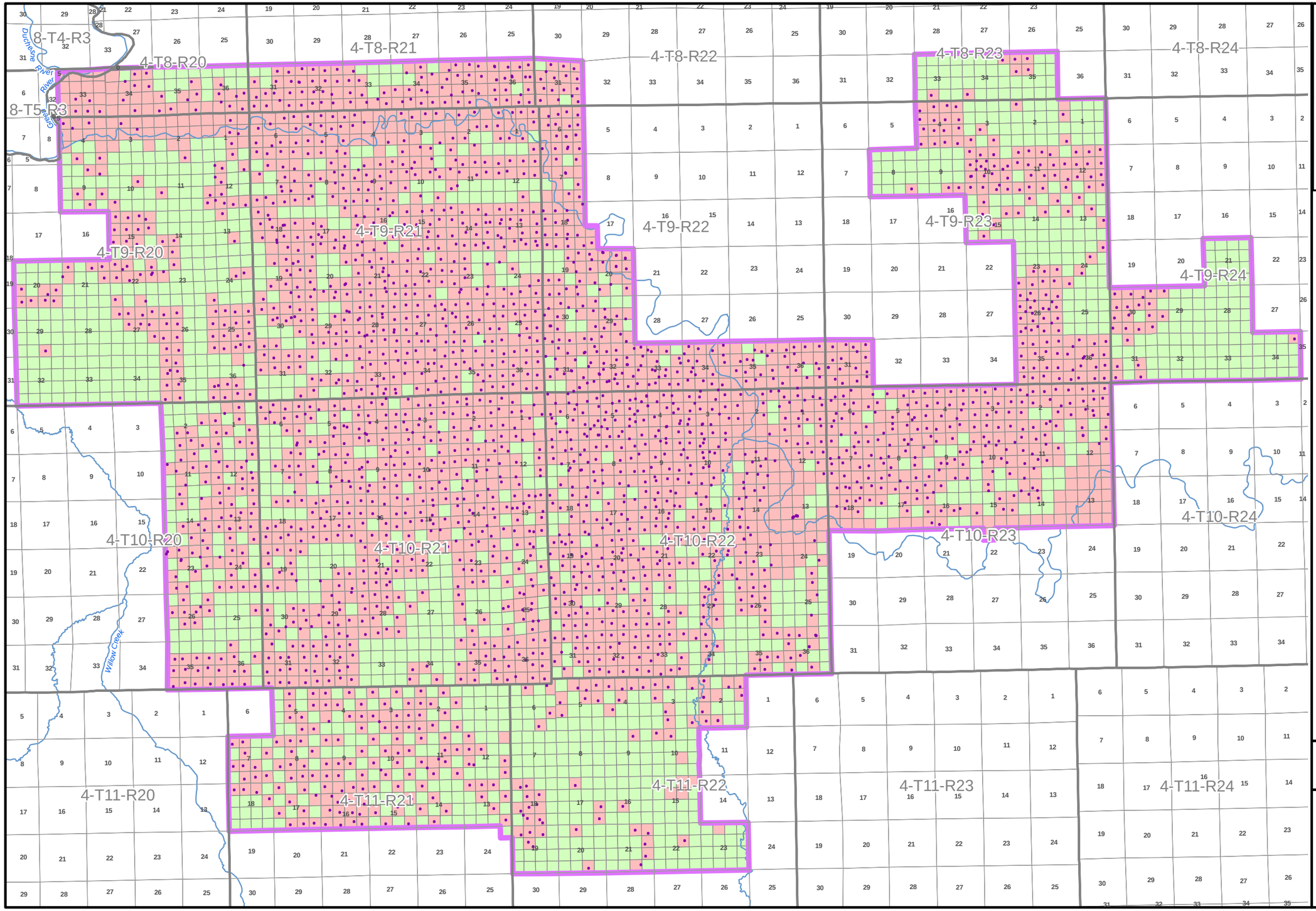
2.7.2.2 Infill Drilling and Multiple-well Pads

Infill drilling would be performed on 40-acre surface spacing (maximum of 16 well pads per section) throughout the GNBPA using vertical and directional drilling techniques. The location of the 40-acre spaced well pads would reflect avoidance of the following constraining factors:

- Topography, including steep slopes that preclude construction of a well pad for a vertically drilled well without major cuts-and-fills;
- The viewshed of the White River corridor (line-of-sight from the centerline up to 0.5 mile along both sides of the river), outside of the Indian Trust Lands;
- Areas within 600 feet of the White River within the Indian Trust Lands; and
- Areas within the 100-year floodplain of the White River, including Tribal Lands, and 5 miles up major tributaries.

The Resource Protection Alternative would reduce impacts to other resources by limiting disturbance to a total of 16 well pad locations per section in comparison to as many as 32 well pad locations per section under the Proposed Action Alternative.

As of October 2007, there were approximately 1,484 available 40-acre spacing locations for new well pads within the GNBPA. Under this alternative, it has been assumed that KMG would drill 634 Mesaverde-only completions from deepened recompletions or twinned wells on existing well pads as was the case for the Proposed Action. Limiting surface disturbance to 40-acre well pad spacing would reduce the number of possible new well pads from 3,041 to 1,484 under the Resource Protection Alternative. If full recovery of the natural gas resource requires the drilling of wellbores at a downhole spacing of 20 acres or less, then directional drilling techniques would be required under this alternative. Therefore, impact analysis of this alternative assumed 1,557 directionally drilled wellbores to establish the same number of wellbores (3,675) as the Proposed Action Alternative.



Greater Natural Buttes Area Gas Development Project EIS

Figure 2.7-1

Resource Protection Alternative

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2.7.2.3 Gas Pipelines

As was the case with the Proposed Action Alternative, surface gas gathering pipelines are assumed to be co-located with access road ROWs approximately 95 percent of the time and would be installed cross-country approximately 5 percent of the time. Under this alternative, approximately 564 miles of co-located and approximately 30 miles of cross-country surface pipeline would be installed. Approximately 35 miles of larger-diameter, buried transport pipeline would be constructed within a 75-foot-wide construction ROW that would overlap with other ROWs when possible.

2.7.2.4 Water Disposal Facilities

Produced water would be handled in the same manner as discussed under the Proposed Action Alternative. Because of differing numbers of well pads, wellbores, and road lengths, the volumes of produced water and amount of truck transport would differ. For this alternative, annual truck transport of produced water is estimated to be approximately 107,444 truckloads over an average of approximately 10 miles roundtrip, assuming an average truck capacity of 100 bbls. Average annual produced water from this alternative is estimated to be approximately 1,385 acre-feet.

In the event that KMG were to proceed with construction of a water gathering pipeline system on the ground surface co-located within access road ROW disturbance, approximately 458 miles of surface pipeline could be constructed without increasing the surface disturbance. KMG would identify a solution to the issue of freeze protection prior to installation of aboveground water gathering pipelines. However, as with the Proposed Action Alternative, approximately 25 miles of buried connecting water flowlines within a 75-foot ROW would be needed to transport water to the water disposal wells.

2.8 Optimal Recovery Alternative

A summary of surface disturbance associated with implementation of the Optimal Recovery Alternative is indicated in **Table 2.8-1**. The disturbance indicated in **Table 2.8-1** is new disturbance that would occur in addition to that from the No Action Alternative.

Table 2.8-1 Optimal Recovery Alternative Summary of New Surface Disturbance

New Facilities	Multiplier (number or miles)	Size (ROW width [feet] or acres/facility	Surface Disturbance (acres)
Roads			
Access Roads[1]	1,627 miles	45 feet	8,875
Well Pads			
New Single Well Pads	12,812 each	2.5 acres	32,030
Twinned Well Pads (Additional Disturbance)	634 each	0.2 acre	127
Multi-well Pads (Additional Disturbance)	0 each	0.2 acre	0
Well Pad Subtotal	***13,446 each***		***32,157***
Construction/Production Facilities			
Mancamps	2 each	5 acres	10
Compressor Stations	5 each	20 acres	100
Water Tank Batteries	5 each	3 acres	15
Water Injection Facilities (Additional Disturbance)	25 each	0.2 acre	5
Facilities Subtotal			***130***
Linear Facilities			
Gas Gathering Pipelines – Common ROW	1,546 miles	0 feet	0
Gas Gathering Pipelines – Cross-country	81 miles	20 feet	197

Table 2.8-1 Optimal Recovery Alternative Summary of New Surface Disturbance

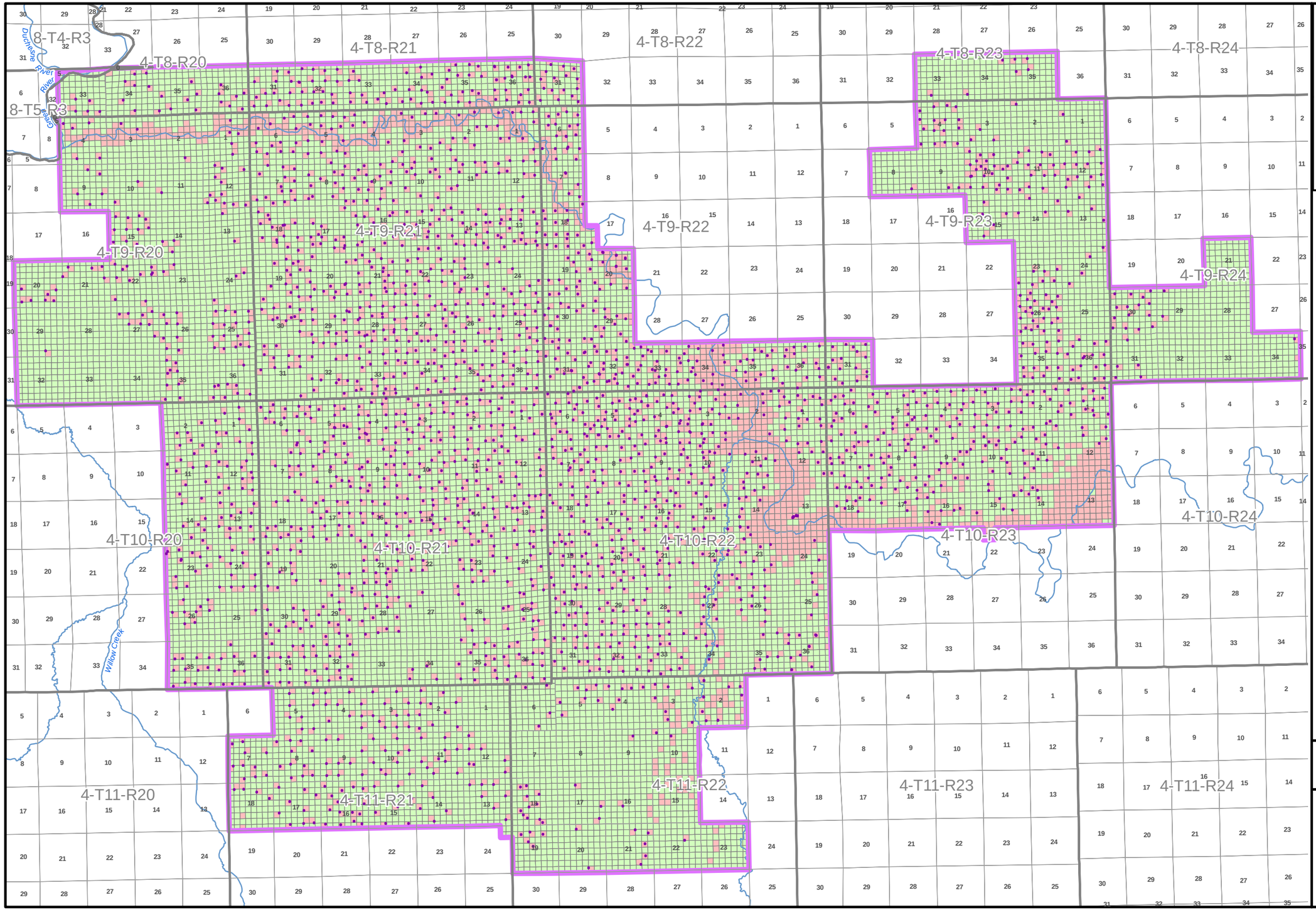
New Facilities	Multiplier (number or miles)	Size (ROW width [feet] or acres/facility	Surface Disturbance (acres)
Gas Transport Pipelines (Buried)	70 miles	75 feet	636
Water Gathering Pipelines – Common ROW (Surface)	1,256 miles	0 feet	0
Water Connecting Pipelines (Buried)	50 miles	75 feet	455
Electric Power Lines	14 miles	100 feet	170
Linear Facilities Subtotal			***1,458***
Optimal Recovery Alternative New Disturbance			***42,620***
GNBPA New Disturbance (%)			***26%***
No Action Alternative New Disturbance (acre)			***4,702***
Existing Surface Disturbance (acre)			***7,766***
Total Surface Disturbance (acre)			***55,088***
Total GNBPA Disturbed (%)			***34%***
Surface Disturbance Interim Reclamation Estimates[2]			
Reclaimable New Surface Disturbance (acre)			13,189
Reclaimable No Action New Surface Dist (acre)			1,753
Reclaimable Existing Surface Disturbance (acre)			3,267
Total Est. Reclaimable Surface Disturbance (acre)			18,209
Reclaimable Surface Disturbance (%)			33%
Reclaimable Surface Disturbance as % of GNBPA			11.2%

[1] Assume access road length of 0.127 mile/well pad.
[2] Interim reclamation estimates are based on the potential to reclaim 0.5 acre per new well pad, 27 feet ROW for new access roads, and all new Linear Facilities summarized in the table above.

2.8.1 Field Development Plan and Schedule

The Optimal Recovery Alternative is designed to maximize recovery of the gas resource by increasing the number of wellbores to achieve 10-acre surface and downhole spacing throughout the GNBPA. **Figure 2.8-1** illustrates the available locations for new wells. Based on proposed activities identified as common to all alternatives, KMG and other operators would drill an estimated 13,446 new wellbores in addition to the existing producing wells and approved/permitted wells yet to be drilled in the GNBPA. KMG's activities would remain largely as outlined under the Proposed Action Alternative. Additional wells would be drilled at an average rate of approximately 672 wells per year using 28 drilling rigs and would be drilled over a period of approximately 20 years or until the resource base is fully developed. The total number of wells drilled during the life of the project or during any particular year would depend largely on factors outside of KMG's control. The estimated productive life of each well would be approximately 30 to 50 years, and 3 percent of the drilled wellbores might be dry principally due to mechanical failure.

The drilling schedule, well drilling and completion parameters, equipment and manpower requirements, compressor stations, water disposal facilities, buried water and gas pipelines, electric power facilities, and ancillary facilities would be similar to that discussed under the Proposed Action Alternative. However, in some cases more facilities would be constructed because of the higher number of wells and increased gas volumes produced.



- Existing and Approved Wells
- Named Streams and Rivers
- Township/Range
- Sections
- EIS Project Area

Potential Locations for New Well Pads

Optimal Recovery (1 pad per 10 acres)

- 0
- 1

N

Scale in Miles

Scale in Kilometers

Greater Natural Buttes Area Gas Development Project EIS

Figure 2.8-1

Optimal Recovery Alternative

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2.8.2 Alternative-specific Activities

2.8.2.1 Access Roads

Approximately 1,627 miles of new access road would be constructed to 12,812 new well pads. Because many more well pads would be constructed than under the Proposed Action Alternative, average access road length would be shorter because of the greater well pad density. For this alternative, the estimated average new access road length would be 0.127 mile.

2.8.2.2 Infill Drilling of Vertical Wells

For onshore reservoirs, drilling individual vertical wells typically is the most technically and cost efficient method of recovering the gas resource. The location of the well pads would reflect avoidance of the following constraining factors:

- Topography, including steep slopes that preclude construction of a well pad for a vertically drilled well;
- The viewshed (line-of-sight from the centerline up to 0.5 mile along both sides of the river) of the White River corridor, outside of the Indian Trust Lands; and
- Areas within 600 feet of the White River within the Indian Trust Lands.

It has been estimated that approximately 470 locations at 10-acre spacing could not be drilled from vertical well pads in these constrained areas. Recovery of the natural gas resource would require the use of directional drilling techniques, which KMG has not yet determined to be technically or economically feasible within the GNBPA. Accordingly, these locations have not been analyzed in this EIS.

All of the rest of the undrilled GNBPA would be assumed to be drilled using vertical wells from individual well pads. Accounting for 1,562 existing productive wells and 1,102 additional approved wells drilled under the No Action Alternative, there would be room for 12,812 new well pads drilled on 10-acre surface spacing.

Approximately 27,699 acre-feet of water would be required to drill and complete the 13,446 total wells, or approximately 1,385 acre-feet annually during the 20 years required to complete this Optimal Recovery Alternative.

The number of mancamps needed for the Optimal Recovery Alternative would be the same as that needed for all other action alternatives; two camps at 5 acres each.

2.8.2.3 Gas Pipelines

A total of approximately 1,627 miles of natural gas surface gathering pipeline would be installed to transport natural gas from project wells to larger buried pipelines that connect to processing facilities. Approximately 1,546 miles (95 percent) would be placed in available access road ROWs, and approximately 81 miles (5 percent) would require cross-country routing outside of access road ROWs. Cross-country routing would require a 20-foot ROW for construction. Approximately 70 miles of larger-diameter, buried transport pipeline would be constructed within a 75-foot-wide construction ROW that would overlap with other ROWs when possible.

2.8.2.4 Gas Compression and Processing

Five compression sites would be constructed to meet project compression needs within the GNBPA; each site would require approximately 20 acres for the life of the facility. These facilities would provide a total additional 197,500 hp of compression; half gas-fired and half electrically driven.

2.8.2.5 Electrical Power Requirements

Under the Optimal Recovery Alternative, approximately 14.0 miles of overhead electric lines would be installed to provide power to the pumps at the proposed water disposal wellsites. The new power lines would be 35-kV distribution lines that would originate from the existing power grid. Pole mount transformers would be installed within 500 feet of each point of use to obtain 480-volt power for the pumps. The power lines would be installed within a 100-foot ROW. Surface disturbance associated with electric power line installation within the ROW would be reclaimed as soon as construction is completed.

2.8.2.6 Water Disposal Facilities

Under this alternative, 25 new disposal wells would be drilled in the GNBPA on existing well pads or using existing well borings located in Sections 19 through 36, T9S, R21E. Locations would be chosen based on suitable subsurface rock properties and water quality data. Sites of five of the more centrally located existing or proposed produced water disposal wells would contain several produced water storage tanks. Approximately 50 miles of 4- to 12-inch, buried polypropolene pipe water flowlines would be installed within a 75-foot-wide ROW to interconnect all new and existing water management facilities including salt water disposal wells, evaporation/recycle ponds, and centralized tank batteries.

Transport of produced water would be handled in the same manner as discussed under the Proposed Action Alternative. For this alternative, annual truck transport of produced water is estimated to be approximately 393,114 truckloads over an average of approximately 10 miles roundtrip, assuming an average truck capacity of 100 bbls.

In the event that KMG were to proceed with construction of a surface water gathering pipeline system co-located within access road ROW disturbance, similar to that described for the Proposed Action, approximately 1,256 miles of surface pipeline would be constructed.

2.9 Alternatives Considered but Eliminated from Further Consideration

The BLM considered two alternatives to the proposed project that were not carried forward for detailed analysis in subsequent chapters of this document. The following sections describe these alternatives and provide the rationale for why the BLM eliminated the alternatives from further detailed consideration.

No Further Development: The BLM considered an alternative under which no further development would take place in the GNBPA. This alternative was eliminated from detailed analysis because ongoing oil and gas development continues on valid leases within the GNBPA as disclosed under existing NEPA decision documents (see Section 2.4.1). The decisions in the existing NEPA documents are not being revisited under this EIS. The no further development alternative is frequently mistaken for the No Action Alternative, which is required to be analyzed under NEPA. For this project, the No Action Alternative would occur if the BLM were to deny KMG's proposal, and development would continue in the GNBPA under existing NEPA disclosures. The No Action Alternative is fully analyzed in this document (Section 2.4 and analysis sections in Chapter 4).

Phased Development: The BLM considered a phased development alternative, which was intended to rotate concentrated disturbance activities through smaller, pre-defined areas (subareas), while the remainder of the GNBPA would be less impacted than under the Proposed Action. Under this alternative, oil and gas development activities would be restricted to one of several subareas within the GNBPA boundary. One subarea at a time would be open to oil and gas construction and development activities for a limited time period, after which construction and development activities would cease. An indicator, such as successful interim reclamation within a subarea, would be required to be met prior to developing a new subarea. Oil and gas extraction and processing would continue (i.e., operational activities) in the subarea, while construction and development activities would move to another subarea. An additional intent was to encourage concurrent and efficient reclamation of surface disturbance.

For the following reasons, the BLM eliminated this alternative from further detailed analysis in this EIS:

- Phased development could not be imposed by the BLM on state, Tribal, and private lands within the GNBPA. These lands make up almost one-half (45 percent) of the GNBPA, thereby reducing the benefit of a phased development approach.
- The BLM would still be required to process "reasonable access" ROW applications for development of private and state leases within the subareas not currently being developed (BLM Manual, Part 2800.06 "Policy" [D], allowing owners of non-federal lands surrounded by public lands managed under the FLPMA to develop for the reasonable use and enjoyment of these non-federal lands).
- Phased development could delay benefits to surface owners within the GNBPA (e.g., payments to the Ute Tribe for surface disturbance activities). In addition, job preference for Ute Tribe members when work activity occurs on Tribal lands could be delayed.
- The GNBPA is primarily located within an already developed field. The Proposed Action would downspace existing development. Phased development would concentrate traffic and drilling activities in the active subarea, but production and maintenance activities in the existing field would continue regardless of subarea.
- Under a phased development scenario operators would be unable to return to subareas where construction and development activity has ceased. This would prevent redevelopment of a subarea in the event that a change in commodity price or an improvement in drilling technology were to make the subsurface resource that was previously passed over economically viable.
- Concentrated development under a phase development alternative would focus surface disturbance impacts within individual grazing allotments. This could result in rapid reduction in forage and a corresponding reduction in animal unit months (AUMs).

2.10 Comparison of Alternatives

A comparison of disturbance within the GNBPA associated with the four alternatives is provided in **Table 2.10-1**. Impacts by resource associated with the alternatives are provided in **Table 2.10-2**.

Table 2.10-1 Disturbance Comparison for GNBPA Alternatives (Excluding Existing Condition)

New Facilities	Size (ROW width [feet] or acres/facility)	New Surface Disturbance by Alternative							
		No Action		Proposed Action		Resource Protection		Optimal Recovery	
		Multiplier (number or miles)	Disturbance (acres or % of GNBPA)	Multiplier (number or miles)	Disturbance (acres or % of GNBPA)	Multiplier (number or miles)	Disturbance (acres or % of GNBPA)	Multiplier (number or miles)	Disturbance (acres or % of GNBPA)
Roads									
Access Roads[1]	45 feet	276 miles	1,503	760 miles	4,147	594 miles	3,238	1,627 miles	8,875
Well Pads									
New Single Well Pads	2.5 acres	1,102 each	2,755	3,041 each	7,603	1,484 each	3,710	12,812 each	32,030
Twinned Well Pads (Additional Disturbance)	0.2 acre	0 each	0	634 each	127	634 each	127	634 each	127
Multi-well Pads (Additional Disturbance)	0.2 acre	0 each	0	0 each	0	1,557 each	311	0 each	0
Well Pad Subtotal		1,102 each	2,755	3,675 each	7,729	3,675 each	4,148	13,446 each	32,157
Construction/Production Facilities									
Mancamps	5 acres	0 each	0	2 each	10	2 each	10	2 each	10
Compressor Stations	20 acres	6 each	120	2 each	40	2 each	40	5 each	100
Water Tank Batteries	3 acres	8 each	24	2 each	6	2 each	6	5 each	15
Water Injection Facilities (Additional Disturbance)	0.2 acre	0 each	0.0	15 each	3	15 each	3	25 each	5
Construction/Production Facilities Subtotal			144		59		59		130
Linear Facilities									
Gas Gathering Pipelines – Common ROW	0 feet	262 miles	0	722 miles	0	564 miles	0	1,546 miles	0
Gas Gathering Pipelines – Cross-country	20 feet	14 miles	33	38 miles	92	30 miles	72	81 miles	197
Gas Transport Pipelines (Buried)	75 feet	0 miles	0	35 miles	318	35 miles	318	70 miles	636
Water Gathering Pipelines – Common ROW (Surface)	0 feet	0 miles	0	587 miles	0	458 miles	0	1,256 miles	0
Water Connecting Pipelines (Buried)	75 feet	26 miles	236	25 miles	227	25 miles	227	50 miles	455
Electric Power Lines	100 feet	2.5 miles	30	7 miles	85	7 miles	85	14 miles	170
Linear Facilities Subtotal			300		722		702		1,458
New Surface Disturbance (acre)			4,702		12,658		8,147		42,620
GNBPA New Disturbance (%)			2.9%		7.8%		5.0%		26.2%
No Action Alternative New Disturbance (acre)					4,702		4,702		4,702
Existing Surface Disturbance (acre)			7,766		7,766		7,766		7,766
Total Surface Disturbance (acre)			12,468		25,125		20,615		55,088
Total GNBPA Disturbed (%)			7.7%		15.4%		12.7%		33.8%
Surface Disturbance Interim Reclamation Estimates[2]									
Reclaimable New Surface Disturbance (acre)			1,753		4,731		3,387		13,189
Reclaimable No Action New Surface Dist (acre)					1,753		1,753		1,753
Reclaimable Existing Surface Disturbance (acre)			3,267		3,267		3,267		3,267
Total Est. Reclaimable Surface Disturbance (acre)			5,020		9,751		8,407		18,209
Reclaimable Surface Disturbance (%)			40.3%		39%		41%		33%
Reclaimable Surface Dist as % of GNBPA			3.1%		6.0%		5.2%		11.2%

[1] Assume access road length of 0.25 mile/well pad for No Action and Proposed Action; 0.4 mile/well pad for Resource Protection Alternative; 0.127 mile/well pad for Optimal Recovery Alternative.

[2] Interim reclamation estimates are based on the potential to reclaim 0.5 acre per new well pad, 27 feet ROW for new access roads, and all new Linear Facilities summarized in the table above.

Table 2.10-2 Impact Comparison by Resource for All Alternatives

Resource	No Action Alternative	Proposed Action Alternative	Resource Protection Alternative	Optimal Recovery Alternative	Additional Discussion
Air Quality					
Air Quality (exceed National Ambient Air Quality Standards [NAAQS])	No	No	No	Potential[1]	Section 4.1
Acid Deposition (exceed U.S. Forest Service [USFS] threshold)	Yes (1 area)[2]	Yes (1 area)[2]	Yes (1 area)[2]	Yes (1 area)[2]	Section 4.1
Visibility (Class I)	Cumulative impacts > 1.0 deciview (dv)	Incremental impacts < 1.0 dv	Incremental impacts < 1.0 dv	Incremental impacts < 1.0 dv	Section 4.1
Visibility (Class II)	Cumulative impacts > 1.0 dv	Incremental impacts > 1.0 dv at 2 areas	Incremental impacts > 1.0 dv at 2 areas	Incremental impacts > 1.0 dv at 2 areas	Section 4.1
Greenhouse Gas (GHG) Emissions (10^3 tonne carbon dioxide equivalents [CO_2e]/year)	1,761	2,754	2,754	5,485	Section 4.1
Cultural Resources and Native American Traditional Values					
Sites potentially encountered (incremental due to new surface disturbance)	52	142	90	475	Section 4.2
Geology					
Recoverable Gas Resources Over the Life of the wells (trillion cubic feet [Tcf])	1.41	6.07	6.07	15.44	Section 4.3
Recoverable Condensate Resources Over the Life of the Wells (million bbls)	22.3	86.5	86.5	118	Section 4.3
Land Use					
White River Special Recreation Management Area (SRMA) (incremental acres disturbed)	7.8	49	32	164	Section 4.4
Paleontology					
Potential Fossil Yield Classification (PFYC) Class 4 or 5 areas (potential incremental acres disturbed)	4,467	12,025	7,740	40,489	Section 4.5
Range Resources					
AUMs Lost – BLM	352	947	609	3,186	**Tables 4.6-1**, **4.6-2**, **4.6-4**, and **4.6-6**
AUMs Lost – BIA	26	71	46	239	**Tables 4.6-1**, **4.6-2**, **4.6-4**, and **4.6-6**
Total AUMs Lost	378	1,018	655	3,425	
Number Rangeland Improvements Impacted (BLM land only)	NA	26	15	27	**Tables 4.6-3**, **4.6-5**, and **4.6-7**
Socioeconomics					
Energy Resource Recovery					Section 4.8 and **Table 4.8-1**
Natural Gas (Tcf)	1.41	6.07	6.07	15.44	
Oil Condensates (million bbl)	22.3	86.5	86.5	117.9	
Projected end of production (year)	2051	2059	2059	2066	
Employment (number jobs)					Section 4.8 and **Tables 4.8-5**, **4.8-9**, and **4.8-13**
Peak – development	1,790	4,302	4,302	9,024	
Average – production	239	875	875	1,712	

Table 2.10-2 Impact Comparison by Resource for All Alternatives

Resource	No Action Alternative	Proposed Action Alternative	Resource Protection Alternative	Optimal Recovery Alternative	Additional Discussion
Population – Duchesne and Uintah counties					Section 4.8 and **Tables 4.8-6**, **4.8-10**, and **4.8-14**
Peak – development	2,585	5,590	5,590	8,368	
Average – production	450	1,508	1,508	2,732	
Temporary and permanent housing demand in Duchesne and Uintah counties during development (units)	1,593	3,447	3,447	5,159	Section 4.8 and **Tables 4.8-6**, **4.8-10**, and **4.8-14**
Grazing – Reduction in annual cash farm receipts ($24 per AUM lost)	As much as $7,632 lost	As much as $24,432 lost	As much as $15,720 lost	As much as $82,200 lost	Section 4.8
Public Sector Revenues – Cumulative Life of Field[3] (millions of 2006 dollars)					Section 4.8 and **Tables 4.8-8**, **4.8-12**, and **4.8-16**
Ad Valorem Taxes	89.2	343.8	343.8	856.1	
Utah Severance Taxes	270.5	1,146.7	1,146.7	2,709.5	
Federal and Tribal Mineral Royalties	417.9	2,692.4	2,692.4	6,333.9	
State Public School Fund Royalties	158.9	673.1	673.1	1,582.5	
Combined Public Sector Revenues	1,154.3	4,856.0	4,856.0	11,481.0	
Percent Increase over No Action	N/A	321	321	895	
Soils					
High Constraint (incremental acres disturbed)	4,396	11,835	7,618	39,849	**Table 4.9-1**, **Appendix F**
Moderate Constraint (incremental acres disturbed)	141	380	244	1,279	
Low Constraint (incremental acres disturbed)	165	443	285	1,492	
Transportation and Access					
New Access Roads (miles)	276	760	594	1,627	Section 4.10
Increase in Traffic Volume at Full Production (total number vehicle miles)	0	20,948	20,948	59,162	Section 4.10
Number of Annual Incidents (mostly minor accidents and spills)	22	58	58	201	Section 4.10
Vegetation					
Uinta Basin hookless cactus potential preferred habitat (estimated incremental acres disturbed)	1,576	4,369	2,731	14,201	Section 4.11
Vegetation Type (estimated incremental acres disturbed)					**Tables 4.11-1**, **4.11-2**, **4.11-3**, **4.11-4**
Salt-desert shrubland	1,932	5,279	3,437	17,775	
Sagebrush shrubland	1,663	4,548	2,961	15,313	
Grassland	455	1,246	811	4,194	
Cliff/Canyon	217	593	386	1,997	
Riparian	143	189	29	637	
Pinyon-juniper woodland	82	225	147	758	
Agriculture	30	81	53	274	
Barren	178	490	319	1,650	
Developed	2	7	4	22	

Table 2.10-2 Impact Comparison by Resource for All Alternatives

Resource	No Action Alternative	Proposed Action Alternative	Resource Protection Alternative	Optimal Recovery Alternative	Additional Discussion
Visual Resources					
Visual Resource Management (VRM) Class II areas on federal lands (incremental acres disturbed)	0	91	58	305	Section 4.12
Incremental Disturbance Visible from (acres):					Section 4.12
Boaters on the White River	1,287	3,461	2,218	11,536	
Goblin City Overlook	140	377	242	1,257	
Water Resources					
Surface Water Uses (acre-feet/year)	550	800	800	1,925	Section 4.13
100-year Floodplains (incremental acres disturbed)	325	288	0	1,510	Section 4.13
Wilderness Characteristics					
BLM White River Natural Area (incremental acres disturbed)	0	0	0	0	Section 4.14
Non-wilderness Study Area Lands with Wilderness Characteristics (estimated incremental acres disturbed)	81	217	139	724	Section 4.14
Wildlife Resources					
Big Game Habitat (estimated incremental acres disturbed)					**Tables 4.15-1**, **4.15-3**, **4.15-5**, and **4.15-7**
Pronghorn Year-long Crucial	3,183	10,264	6,607	34,562	
Pronghorn Year-long Substantial	67	179	116	604	
Mule Deer Year-long Crucial	553	1,488	958	5,011	
Mule Deer Winter Substantial	68	183	118	615	
Elk Winter Substantial	9	24	16	82	
Rocky Mountain Bighorn Sheep Year-long Crucial	781	2,103	1,354	7,082	
Bison Year-long Crucial Range	3,406	9,168	5,901	30,869	
Potential White-tailed Prairie Dog Habitat (estimated incremental acres disturbed)	4,258	11,644	7,581	39,206	Section 4.15
Greater Sage-grouse Habitat (estimated incremental acres disturbed)					**Tables 4.15-2**, **4.15-4**, **4.15-6**, and **4.15-8**
2.0 Mile Lek Buffer	442	1,190	766	4,007	
Nesting	675	1,817	1,169	6,117	
Brooding	1,782	4,797	3,088	16,153	
Winter	1,356	3,649	2,349	12,288	
Fisheries Resources					
Estimated total water depletions for life of the project (acre/feet)	2,270	7,571	7,571	27,700	Section 4.15

[1] 2006 meteorological data show modeled concentrations of ozone between 76 and 79 ppb; 2005 meteorological data show modeled concentrations of ozone below 76 ppb.

[2] Modeled deposition from action alternatives does not exceed Federal Land Managers' Air Quality Related Values Workgroup (FLAG) thresholds, except for Mesa Verde National Park, which is predicted to exceed thresholds for the No Action Alternative.

[3] The public sector revenue projections assume constant natural gas prices of $4.59/thousand cubic feet (Mcf) and $45/barrel for liquids. However, energy prices fluctuate over time. Actual sector revenues could be higher or lower than shown, depending on future prices and production. Such variance would affect all alternatives.